COMMERCIAL FISHERIES Review

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DIV. OF FISHES

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COVER: Fishing fleet at Annapolis, Md.
(Authenticated News)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

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Throughout this book, the initials BCF stand
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CONTENTS

	Page
UNITED STATES	
Events and Trends	1
States	13
Bureau of Commercial Fisheries Programs	18
ARTICLES	27
Oceanography's Role in Developing Marine Resources, by James H. Johnson	
Improving and Expanding the Distribution of Fresh (Unfrozen) Seafoods by Means of Insulated Containers, by Staff of the BCF Technological Laboratory, Gloucester, Massachusetts	
Submarine Photos of Commercial Shellfish Off Northeastern United States, by Roland L. Wigley and K. O. Emery	
INTERNATIONAL	50
FOREIGN	
Canada	57
Europe	58
Latin America	62
Asia	66
South Pacific	71
Africa	72
INDEX	75

Massachusetts Fisherman.
(Standard Oil of N. J.)

1967 U. S. SHRIMP LANDINGS SET RECORD

The shrimp was the most valuable species to U. S. fishermen in 1967. Landings of 313 million pounds (heads on) were worth $102 million--a record quantity and value. The previous high catch was 268 million pounds in 1954.

Shrimp is the first marine fishery resource to attain a value of more than $100 million to domestic fishermen.

The 1967 landings were up 80 million pounds and more than $6 million over 1966. All shrimp-producing areas, except the South Atlantic, registered gains.

Maine, Alaska, and Oregon achieved much greater percentage increases in landings than other areas; records were set in the three States.

The Southern States contributed 79 percent to the total--down from 84 percent in 1966.

GULF OF MEXICO

Landings at Gulf of Mexico ports rose 45 million pounds. This increase was produced by a record supply of the brown species in the northern Gulf off Louisiana and Texas. Landings were heavy during the summer, the peak of the brown shrimp season. Nearly half the 1967 Gulf shrimp catch was landed during June, July, and August. During 1957-66, only 35 percent was landed during these 3 months.

In September, Hurricane Beulah paralyzed fishing and damaged many vessels (some were destroyed) and shore establishments. Major damage centered in the area of Pt. Isabel-Brownsville, Texas, an important shrimp production center, but a wider area was affected. (BCF Branch of Fishery Statistics.)

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UNITED STATES

Set 1968 Tariff Rates for Groundfish Fillet Imports

The reduced-tariff-rate import quota on fresh and frozen groundfish (cod, haddock, hake, pollock, cusk, and ocean perch) fillets and steaks for 1968 is 24,894,900 pounds. This was announced by the Bureau of Customs in the Feb. 7, 1968, "Federal Register."

During each quarter of 1968, 6,223,725 pounds of groundfish fillets and steaks may be imported at the $1\frac{7}{8}$ cents-per-pound rate of duty; imports over the quarterly quota will be dutiable at the rate of $2\frac{1}{2}$ cents a pound.

Quantity Increased 25% in 1951-1960

The reduced-rate import quota for 1968 changed only slightly from the 1967 quota of 24,883,313 pounds. From 1951 to 1960, the quantity of fresh and frozen groundfish fillets permitted to enter the U. S. at reduced duty rate of $1\frac{7}{8}$ cents a pound had increased 24.7 percent. In 1961, however, the trend was reversed significantly for the first time. It occurred because in 1960 frozen fish fillet blocks with bits and pieces had become no longer dutiable under tariff category "frozen groundfish fillets."

Kennedy Round Concessions

U. S. concessions granted in the 1964-67 Geneva trade conference (Kennedy Round) reduced the duty rate on fish blocks (with bits and pieces) from 1 cent a pound to 0.8 cent a pound on Jan. 1, 1968.

Concessions on fish blocks are being put into effect in 5 equal annual stages. The final reduction will become effective Jan. 1, 1972. Then fish blocks will be duty free.

1967 U. S. Salmon Landings Were Way Down

Preliminary records indicate the 1967 U. S. catch of salmon of 204 million pounds was down 184 million from 1966. It was 96 million less than the annual average during 1957-66. A big drop in Alaska landings was offset partially by a significant increase in Washington and Oregon. During 1967, landings in Washington, Oregon, and California were 73 million pounds, an increase of nearly 19 million from 1966--and nearly 22 million pounds above the average yearly catch during 1957-66.

The 1967 Alaska salmon catch was a failure: landings of 131 million pounds were the lowest since 1899. The catch was 61 percent less than 1966, and 47 percent lower than the average for 1957-66. Yearly records of total catch are available since 1865, but a listing by species was first recorded in 1906. Over the years, the pink species has dominated the Alaska salmon catch. It was followed closely by red (sockeye). Both species made up $\frac{3}{4}$ percent of the total salmon catch. For the 61-year period, 1906-66, Alaska salmon landings were: pink 43%, red (sockeye) 33%, chum (keta) 16%, silver (coho) 5% and chinook (king) 4%.

Pink Salmon At Record Low

The 1967 Alaska catch of pink salmon was 27 million pounds--a record low. It was only one-fourth the average yearly landings during 1957-66. The previous low catch of pink salmon was close to 31 million pounds in 1906, the first year data were collected. Pink salmon landings of less than 50 million pounds occurred in 1906-07, 1909-10, 1920, and 1959. Alaska's 1967 landings of red (sockeye) salmon of 52 million pounds were 18% lower than 1957-66 average. The previous low catch was nearly 36 million pounds in 1963. Red salmon landings of less than 50 million pounds occurred in only 4 years--all since 1954. The 1967 catch of chum (keta) was 29 million pounds, the same as in 1965. It was 40% less than the previous 10-year average. Silver (coho) landings were 12 million pounds, 4 and 2 million less than 1966 and the 1957-66 average, respectively. The previous low silver catch was in 1960--10 million pounds. Landings of king (chinook) in Alaska during 1967 were 10 million pounds--one million above 1966 but about the average annual quantity during 1957-66. (BCF Branch of Fishery Statistics.)

1967 U. S. Fish Meal, Oil, and Solubles Production Declined

According to BCF, U. S. production of fish meal, oil, and solubles during Jan.-Dec. 1967 and 1966 was:

	Jan.-Dec.	
	1/1967	1966
	. . (Short Tons) . .	
Fish Meal and Scrap:		
Alewives	4,508	3,746
Groundfish	7,909	6,311
Herring	9,273	11,850
Menhaden 2/	119,125	134,954
Tuna & mackerel 3/	32,447	29,758
Unclassified	12,157	24,728
Total fish meal & scrap	185,419	211,347
Shellfish meal & scrap	4/	11,773
Grand total meal & scrap	4/	223,120
Fish Solubles:		
Menhaden	51,536	60,769
Unclassified	22,155	22,672
Total solubles	73,691	83,441
	. . (1,000 Lbs.) . .	
Oil, body:		
Alewives	1,827	5/
Groundfish	1,348	536
Herring	5,078	7,862
Menhaden 2/	98,449	144,198
Tuna & mackerel 3/	6,210	4,884
Unclassified (inc. whale)	6,711	6,565
Total oil	119,623	164,045

1/Preliminary data.
2/Includes a small quantity of other species.
3/Includes anchovies.
4/Not available on a current monthly basis.
5/Included with unclassified.

U. S. Foreign Trade

The Bureau of the Census reported the following U. S. foreign trade in selected industrial products for Jan.-Dec. 1967 and 1966:

	Jan.-Dec.	
	1/1967	1966
	. . (Short Tons) . .	
Imports:		
Fish meal & scrap	651,486	447,784
Fish solubles	3,669	4,308
	. . (1,000 Lbs.) . .	
Whale oil, sperm (crude & refined)	51,318	58,166
Exports:		
Fish & fish-liver oils	76,816	77,254
Whale & sperm oil	1,787	4,356

1/Preliminary data.

U. S. Fish Meal Prices Strongly Affected by Peru's 'Sole' Devaluation

The 32% devaluation of Peru's "sole" in September 1967 affected U. S. fish meal prices much more than did Peru's fisheries promotion law of Oct. 6, 1967. This was reported by BCF's Branch of Current Economic Analysis.

The promotion law reduced or eliminated export taxes by about $7 per ton of fish meal. The devaluation reduced the cost of fish meal by about $41 per ton. Together, these gave Peruvian producers about a $48 advantage.

U. S. prices of Peruvian fish meal have dropped about $12 per ton since Oct. 1, 1967. This would mean that Peru's industry is using about three-quarters of the cost reduction to improve its financial situation.

Georges Bank Survey Shows More Cod, Fewer Haddock

The preliminary results of a BCF groundfish survey in the Georges Bank area show somewhat more cod and fewer haddock than usual. The survey provided an estimate of the strength of the 1967-year class of haddock. Almost none was found. This indicates 1967 is one of the weakest year-classes ever measured.

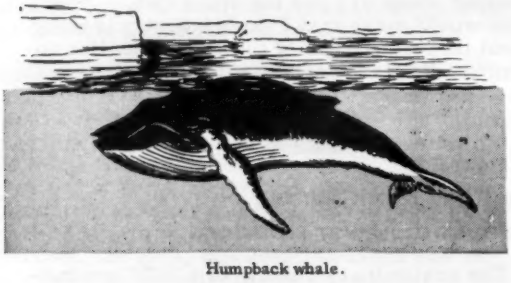
It is bad news for the New England haddock fishery because it is the fourth consecutive poor year-class. Since 1963, which produced the record year-class, there has been poor survival of spawn. The 1963 year-class was overfished by the U. S. and foreign countries in 1965 and 1966 and so cannot maintain the yields of the past 2 years.

Haddock landings will continue to decline for at least 2 more years.

New World Whaling Rules to Bring U. S. Changes

Following recent changes in regulations by the International Whaling Commission (IWC), the U. S. Department of the Interior has proposed to amend U. S. rules to make them conform to the IWC's. ("The Federal Register," Feb. 9, 1968). Only one U. S. firm catches whales.

The proposed change will prohibit commercial whaling for North Atlantic blue whales before 1970 and humpback whales before 1969. There is an exception to the latter: small vessels in Greenland waters may take 10 humpbacks.



Humpback whale.

In the North Pacific and dependent waters, neither blue nore humpback may be taken before 1971.

Whaling Convention & Commission

The International Convention for the Regulation of Whaling has been signed by 16 nations, which are all represented on the Whaling Commission. The Commission meets every year to determine the status of whale resources. From time to time, it amends regulations to protect and conserve these resources.

At present, 4 species have nearly complete protection from commercial operations: right, blue, gray, and humpback. For other species, there are controls on seasons when they may be harvested and on sizes of whales.

U. S. and 4 States Plan Lake Michigan Cleanup

Officials of Interior Department's Federal Water Pollution Control Administration (FWPCA) and 4 states bordering Lake Michigan--Michigan, Illinois, Wisconsin, and Indiana--are meeting in Chicago, Ill., in March to draft a plan to clean up the lake.

Murray Stein, chief enforcement officer for FWPCA, presided at a February meeting of these officials in Chicago. He reported substantial agreement on pollution causes and on what the U. S. and the states have to do. He made clear that an adequate program would cost industry and local, state, and Federal Governments hundred of millions of dollars. But the alternative, he said, was a fate for Lake Michigan similar to that of Lake Erie, which is now almost beyond help.

Pollution Sources

The conferees agreed in February that the major pollution sources included inadequately treated municipal and industrial wastes--and combination sanitary and storm sewers. They listed too: dumping of polluted harbor dredgings, waste from water craft and chemical nutrients, such as nitrogen and phosphates. These chemicals cause algae and other undesirable forms to grow.

Remedies Proposed

There was general agreement that at least 90 percent of the impurities must be removed from municipal and industrial wastes. Also, waste water must be rid of phosphates before reaching the lake. And uniform testing and sampling of water quality must be established.

The conferees are confronted by the problem of obtaining the money they need. They also must agree on deadlines for ending certain types of pollution.

Udall Promises Support

The February conference was called by Interior Secretary Stewart L. Udall. He urged development of a program to save Lake Michigan from an "ugly, useless death." He promised to support fully the ultimate recommendations.

Promote Halibut to Overcome Depressed Market

The Halibut Association of North America is planning a national promotion campaign to aid the halibut industry. North Pacific halibut prices have declined despite a 1967 production of 7.4 million pounds below previous years. Competition from imports is a large part of the problem--particularly from Greenland halibut fillets.

The Association will emphasize 10 major markets: New York, Boston, Philadelphia, Chicago, Los Angeles, San Francisco, Washington, D. C., Baltimore, Minneapolis, and Pittsburgh.

BCF Will Help

BCF will assist in the promotion campaign by asking the U. S. Department of Agriculture to include halibut steaks on its Plentiful Foods List for April. It will try to get radio and TV public-service time to supplement paid advertising by industry. And BCF will encourage retailers to emphasize sales of domestic halibut steaks.

New Loran Stations in Gulf of Mexico

Two new loran stations--one near Brownsville, Texas, the other near Biloxi, Miss.--will enable U. S. fishermen to plot their positions from the stations to within $\frac{1}{2}$ mile at 800 miles and $1\frac{1}{2}$ miles at 1,400 miles. They will know their distance from the Mexican coast. The stations also will help Mexican enforcement of fishing limits and territorial waters.

Receiving sets for vessels cost US$120. The Mexican authorities probably will buy sets for their enforcement vessels. The U. S. and Mexico have agreed on frequencies to use and the U. S. Coast Guard is poised to operate the stations.

Study Effects of Warmed Columbia River on Living Things

The Department of the Interior has announced a 2-year study on the biological effects of sending heated water back into the Columbia River. The $600,000 project is the first study of all aspects of thermal effects on the aquatic environment. The study will be conducted by Interior's Federal Water Pollution Control Administration (FWPCA).

The investigation was prompted by inconsistencies in the water-quality standards of Washington State and neighboring Oregon on temperature changes to be allowed in the Columbia. The study's chief aim is to provide a scientific basis for determining permissible variations in stream temperatures above natural levels.

What Study Involves

The investigation will use information from a mathematical model now being developed to forecast temperature changes in the Columbia resulting from varying heat inputs. The study will enlarge the mathematical model to include the entire river from Canada to the Columbia's mouth at Astoria, Oregon.

A first major step will be to determine the relationship between nitrogen levels and temperature and this combination's effects on anadromous and resident fish. BCF laboratory evidence indicates that the combination of excessive amounts of nitrogen gas and temperature changes can cause fish kills akin to divers' "bends." As water passes through dam spillways, it tends to pick up nitrogen gas from the atmosphere. There are other causes of nitrogen supersaturation; an important one is increases in water temperature.

Cooperative Undertaking

BCF will join FWPCA in the study. A scientific and technical advisory committee on heat effects on flora and fauna will be appointed by Interior Department to assist. Invitations will be sent to Washington, Oregon, Idaho, and Montana; the Atomic Energy Commission, the Bureau of Sport Fisheries and Wildlife, the Corps of Engineers, the Bonneville Power Administration, and the Bureau of Reclamation. The present task force on mathematical model studies will carry on.

"The results of this study are certain to have a major bearing on the whole unsettled question of thermal effects," Interior Secretary Udall said.

Lake Erie Commercial Catch Was Down in 1967

The 1967 commercial catch in Lake Erie was about 48 million pounds, down 6 million pounds from 1966. There were smaller catches in Canadian waters and in the 4 State areas. The 1967 figure was about average for the past 50 years.

There is real concern about further decline of fishing in U. S. waters. During the past few years, several fish companies have gone out of business. Nets and equipment are being advertised for sale, but there are few takers. Most fishermen are discouraged by the outlook. Fishing along Lake Erie's south shore has become a minor business. Little is being done by industry or administrative agencies to reverse this trend.

Commercial fishing in Lake Erie has become primarily a Canadian operation.

President Asks for Fish Inspection Act

On February 6, President Johnson asked Congress to legislate inspection of fish and fishery products. It was one of eight items in his fourth Message on the American Consumer.

The part of the President's message to Congress dealing with fish said:

"Wholesome Fish"

"If poultry inspection is spotty today, fish inspection is virtually non-existent.

"Each year, Americans consume about two billion pounds of fish--nearly 11 pounds per person. A common item in every family's diet, fish can also be an all-too common carrier of disease if improperly processed and shipped.

"Last summer, the Senate Sub-committee on Consumer Affairs heard testimony which disclosed that a substantial amount of the fish sold in this country exposes the consumer to unknown and unnecessary dangers to his health.

"It is impossible to show every link between contaminated fish and illness. Yet these links do exist: links to botulism, hepatitis, and other diseases. About 400 cases of food poisoning, reported on a single weekend in 1966, were traced to fish processed in dirty plants.

"Despite these facts, the Nation has no adequate program for continuous fish inspection--either at the Federal or State level. Nor is there any systematic program for inspecting imported fish and fish products, which account for more than 50 percent of our annual consumption.

"I propose the Wholesome Fish and Fishery Products Act of 1968.

"The bill would authorize the Secretary of Health, Education, and Welfare to:

-- Develop a comprehensive Federal program for consumer protection against the health hazards and mislabeling of fish, shellfish and seafood products.

-- Set standards and develop continuous inspection and enforcement.

-- Support research, training, and inspection programs.

-- Help the states develop their own fish inspection programs.

-- Assure that imported fish products are wholesome."

BCF Would Help Industry

Shortly after the President's message, the U. S. Department of the Interior sent to the Senate and the House of Representatives a draft of proposed legislation "to provide technical and financial assistance to the commercial fishing industry in meeting the requirements of the Wholesome Fish and Fishery Products Act of 1968."

OCEANOGRAPHY

Seismic Survey Planned for East Coast

Interior Department's Geological Survey plans to permit the Continental Oil Company (CONOCO) to conduct a geophysical seismic survey of the Outer Continental Shelf--from Florida waters through the Georges Bank area. The permit will be effective from March 2 until October 1.

The company will use the nonexplosive vibroseis seismic device. It will share information gained from the survey with 14 other oil companies. BCF has advised the fishing industry.

CONOCO is required to keep BCF Regional Directors informed weekly of its operating schedule. When it reaches Georges Bank, it will notify BCF by phone of any schedule changes between weekly reports.

CONOCO has invited BCF and any other interested groups to observe the shooting operations.

Scripps Vessel Begins Bering Sea Research

A research expedition to study how arctic fishes and mammals survive their frozen habitat--and why spawning salmon suffer from a degenerative disease of the arteries--is under way in the Bering Sea. From early March through late September, the 133-foot, 300-ton "Alpha Helix" of the Scripps Institution of Oceanography will be base and laboratory for 50 scientists from 5 nations. BCF is one of 25 participating organizations. The research program is being financed by $574,000 in grants from the National Science Foundation.

Principal investigator for the expedition is Dr. Per F. Scholander, professor of physiology at Scripps and director of its physiological research laboratory.

What They Seek

One reason for the expedition, Dr. Scholander said, is to determine how practical it is to conduct scientific biological and physiological research in that area using the shelter of floating ice to obtain a steady laboratory. Also: "We want to know more about the defense mechanism that fishes have against the interior freezing of their bodies. They have some sort of an inbred anti-freeze, probably combined with some unknown physical mechanism. In arctic marine mammals, the flukes are ice-cold but the rest of their body is warm. How can they conserve body heat under such conditions? . . . . We'll study the respiratory efficiency of gills and microcirculation of fishes living in this frigid environment. We hope to learn how the tissues of a reindeer's antlers grow under such cold conditions. Why are we and Eskimos so sensitive to snowblindness, when arctic mammals and birds are not?"

Salmon Research

The salmon studies will be conducted at Bella Coola, British Columbia. Dr. Andrew A. Benson of Scripps, senior scientist for the salmon research, commented that as the spawning salmon swims from the ocean into and up fresh-water streams, the walls of the arteries leading to the heart muscle become thicker. This reduces circulation to the heart and starves it of oxygen.

"The same situation occurs in human beings suffering from atherosclerosis," he said. "We will study the biochemical and physiological situations in the salmon that are analagous to those in human beings. At this point, no one knows why the walls thicken. We hope our study will help provide some answers." Salmon from the ocean and from fresh water will be studied.

Several scientists in Benson's party have conducted extensive studies with human patients having atherosclerosis, and they will be seeking similar conditions in salmon.

Spawning Salmon Under Stress

In the spawning situation, the salmon is under stress, Dr. Benson explained. There

is a relationship between stress and atherosclerosis, so the salmon will be studied for biochemical and physiological changes that occur under stress. There is some indication that similar changes occur in human beings. Dr. Benson said that stress involves the liberation of fats, such as phospholipids and cholesterol, into the blood. There they circulate and settle in various places--such as the fatty plaques that accumulate on aorta walls in people.

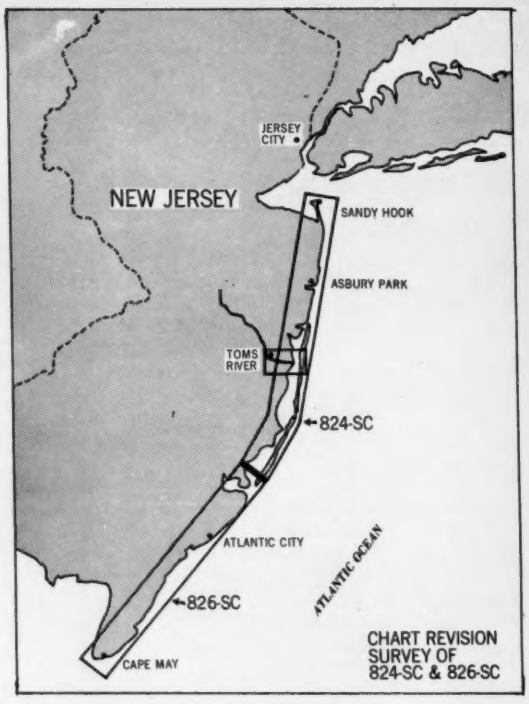
"As far as we know, a salmon doesn't develop this problem," Dr. Benson said. "In the salmon, the cholesterol is kept in solution in the blood and not allowed to attach itself to arterial walls. Our studies will include analysis of the lipid content in the blood for indications of how this condition might differ in the salmon."

LASER Beam Can Aid Hurricane Forecasting

The ocean surface can be profiled from the air with a new method being tested by the U. S. Naval Oceanographic Office (NOO), Suitland, Maryland. NOO scientists are using a recently developed helium neon laser system to analyze ocean waves that are too small or too fast to be measured by usual methods. Development of the new method makes possible observational programs that can provide a basis for accurate forecasts of hurricane wave conditions.

Survey Fixes Navigational Hazards Along N. J. Coast

A hydrographic survey by the Coast and Geodetic Survey of the New Jersey coast from Sandy Hook to Cape May has pinpointed the presence of many sunken wrecks, piles, and other navigational obstructions. It disclosed a sunken wooden barge not visible on the surface but close enough to endanger boats passing over it--on the south side of the channel between Barnegat Inlet and Bay. It also verified or disproved many charted wrecks. A spokesman explained that some have washed or rotted away or were removed over the years.



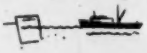
The survey could not find, or found submerged, many piles--such as poles used to anchor boats, or as a foundation for fishing huts, or as private navigation markers. Many existing piers were found in ruins, including the seaward end of a 650-yard pier at Atlantic Highlands. The Coast Survey termed the piers a hazard to small boats.

Depths of Waterways Determined

Accurate depths were determined in the following waterways: Meteconk, Manasquan, Shark and Navesink rivers; Blackberry, Parker, Town, Little River and Troutmans creeks; and smaller waterways in the area.

Many new landmarks found will provide valuable aids to mariners navigating the New Jersey inland waterways. Existing landmarks also were evaluated from the sea to determine their value to marine navigation. Part of Toms River was included in the survey.

The results have been incorporated in new editions of Coast Survey charts 824-SC and 826-SC issued in February 1968.



First Hydrographic Survey in 40 Years Begins in South Puerto Rican Waters

ESSA's Coast and Geodetic Survey began in February a long-range program to survey the entire south coast of Puerto Rico and its offshore waters. It is the first in 40 years. The "Whiting," a 760-ton, 162-foot vessel, is conducting a 3-month hydrographic survey of the 225-square-mile coastal and offshore area between Cabo Rojo and Punta Jorobado.

The Survey's results will be incorporated into new nautical charts planned by the Coast Survey. The charts will benefit commercial shipping, recreational boating, sport and commercial fishing, and ocean research. They will help Coast Guard locate and establish aids to navigation along Puerto Rico's south coast.

Preparations for Survey

In preparation for the hydrographic surveys, color aerial photos were taken in February 1967. From these, shoreline and alongshore features were mapped. The photos and maps will be used to locate signals which will position accurately the survey launches, and to identify underwater dangers.

South Pacific Is Deeper, More Mountainous Than Thought

The bottom of the South Pacific, barely explored until recently, has many more undersea mountains and plateaus than previously reported, discloses the Environmental Science Services Administration (ESSA) of the U. S. Department of Commerce. Many parts of the South Pacific, deeper than formerly thought, are marked with unusual, still-unexplained features. These include giant fractures of the ocean floor that extend in a north-south direction, rather than east-west, as such splits do in the North Pacific bottom.

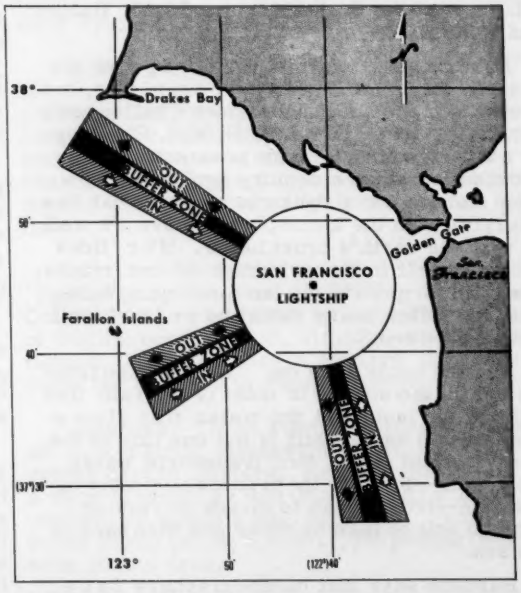
"Oceanographer's" Work

The discoveries are based on data gathered by ESSA's oceanographic survey ship Oceanographer during its global cruise. The data are being processed and studied by scientists in the U. S. and abroad. The task will take years.

The ship's electronic equipment obtained a continuous profile of the bottom. The equipment includes sonar and geophysical devices that plumb the bottom and the rock beneath it. Satellite navigation, with precise depth soundings from a narrow-beam echo sounder, provided a very high degree of accuracy.

Coast Guard to Set Up 'Divided Highway' for San Francisco Waters

The Coast Guard has approved a Sea Lanes system for San Francisco designed to reduce the chance of ship collision in the approaches to San Francisco Bay. It will start in June. The San Francisco plan is similar to those in New York and the Delaware Bay. The Sea Lanes are two one-way lanes separated by a "buffer zone"--much like a divided highway for road traffic.



The Coast Guard is encouraging foreign and domestic steamship lines to use these new, voluntary, safety lanes.

A circle with a radius of 6 miles will be established around the San Francisco Lightship at the Bay's entrance. The new Sea Lanes will fan out from the circumference.

The Coast Guard believes that use of the new safety lanes will reduce the number of head-on-meetings and close-passing situations generally known to create the greatest danger of collision. The basic chart of the area (Coast and Geodetic Survey Chart #5072) will be reprinted in June and include these new Sea Lanes.

New Book Portrays Oceans' Promises and Challenges

Man has relatively little knowledge of the oceans, but this mystery may not continue for long, suggests Dr. John E. Bardach of the University of Michigan in his new book: "Harvest of the Sea" (316 pp., $6.95, Harper and Row, N. Y.).

Bardach says: "Our knowledge of the oceans, though still very incomplete, has grown by leaps and bounds since Challenger's return to port. [Britain's H. M. S. Challenger conducted first genuine oceanographic expedition less than a century ago.] We now view the sea as a dynamic system that has interplay with the atmosphere above as well as with the earth's crust below. Her tides ebb and swell in the estuaries of our rivers. These in turn drain the land, carrying salts, silt, and (after heavy rains) precious soil down to the sea."

And the cycle goes on: "Evaporation from the sea is the source of most of the rain that falls on the land, and the water that flows downstream as a result is but one link in the all-important cycle that transports water molecules--to state the process as simply as possible--from ocean to clouds to rain or snow to soil to lake or river and then back to the sea."

Bardach says that oceanographers face enormous research tasks. While echo-sounding devices that permit the profiling of the sea bottom have been available for years, "the ocean is so vast that at present there do not exist detailed charts even for all inshore areas, to say nothing of the deep ocean basins."

Today, SCUBA (self-contained underwater breathing apparatus), diving saucers, atomic submarines, and bathyscaphes afford a better view of the mysterious underwater world. But, says the author, the great needs are time, study, and money--mostly money.

To Help Feed World

Perhaps the sea's greatest importance, Bardach states, is that its own inhabitants can supply all-important proteins to the earth's inhabitants.

"There is hardly a sea animal that cannot be eaten after proper preparation. Yet we utilize but a small number of all species of animals that make their home in the sea. Of the 25,000 or more existing species of fish we capture consistently for food only about 200. Of the mollusks such as clams and oysters, and of the crustaceans, including shrimp, we use proportionally even less."

Much more light must be shed on harvesting sea life. Bardach explains: "Fishing today is still the stalking of an invisible quarry. Even on the vast commercial scale practiced by the Japanese and Russians, it amounts simply to the taking of nature's surplus. As yet we can do almost nothing to influence the abundance of most marine animals and, beyond certain limits, animal populations cannot be exploited without depleting them."

While some whales and fish stocks have been overharvested, other species are largely untouched, the author points out. The abundant hakes of the North Atlantic, for example, remain beyond present fishing tools.

Other Ocean Wealth

The great continental shelves may contain as many mineral deposits as dry land. There are many possibilities for producing food and other materials--from seaweed cosmetics to sponge-produced antibiotics.

The domestication of land plants and livestock was "one of the most momentous of human cultural advances. Marine plants and animals have really not yet been subjected to the combination of science and husbandry skills that could now be brought to bear on them."

Bardach concludes: "Gathering knowledge about man's interaction with the sea, and truly beginning to understand it, should help us guard against the kind of mistakes we made on land."

Foreign Fishing Off U. S. in January 1968

IN NORTHWEST ATLANTIC

Sixteen foreign fishing vessels (15 Soviet and 1 Polish) fished off southern New England and New York during January. This compares with 19 in December 1967; the 19 included vessels from East and West Germany.

Soviet: The number of vessels increased from about 6 stern trawlers early in the month to 12 by month's end. This was first evidence of increased activity since October 1967. In late January 1967, only a few vessels (believed doing exploratory fishing) were sighted off southern New England.

Throughout January, the vessels were dispersed widely in small groups along the 100-fathom edge of the Continental Shelf--from south of Montauk Point, Long Island (between Hudson and Block Canyons), to areas south of Nantucket Island off Massachusetts. Moderate catches observed on board several vessels appeared to be whiting (silver hake) and red hake.

One or two stern trawlers were reported fishing off Virginia. Catches were not determined.

A factory stern trawler ("Atlantik" class) made debut in Northwest Atlantic. The vessel, "Peter Lizyukov 7117," fished off southern New England and New York.

Polish: Late in January, one stern trawler was sighted among Soviet vessels off southern New England. No catches were observed. Possibly, the Poles are showing some interest in red hake for the future. From August to November 1967, sizable fleets fished heavily for herring on Georges Bank and southern New England. This ended in late November 1967.

East & West Germany: No sightings reported.

Soviet Violations of Mid-Atlantic Agreement: The U. S.-USSR Mid-Atlantic Fisheries Agreement, signed Nov. 25, 1967, has required expanded enforcement and surveillance efforts. These are conducted jointly by the U. S. Coast Guard and BCF.

In January, 5 separate violations of the treaty area, involving 5 individual Soviet vessels, were observed. In each case, between 1 and 3 vessels were fishing actively inside the east boundary of the "no fishing" treaty area. Catches on board several vessels were identified as whiting and red hake.

IN GULF OF MEXICO

No foreign fishing vessels were sighted during January. Soviet vessels continue to transit southward to their fishing grounds off South America. They use the Havana fishing port as supply base. Scattered vessels were seen on Campeche Banks, probably doing exploratory research.

OFF CALIFORNIA

Soviet: No vessels were sighted in January. In January 1967, only a few vessels fished off California.

OFF PACIFIC NORTHWEST

Soviet: Fishing was limited. Only 5 different vessels were sighted: 3 factory stern trawlers (BMRT's), 1 medium refrigerated side trawler (SRT-M), and 1 refrigerated transport. Three of the vessels were research or exploratory types--assumed searching for winter concentrations of fish for the fleet.

Only one vessel (the research vessel "Ogony") was observed on January 30 off the Columbia River with fish (about 1,000 pounds of Pacific ocean perch), although others were fishing. Fishing effort in January 1968 was about the same as in January 1967.

Japanese: Three stern trawlers operated off U. S. Pacific Northwest coast, but only during part of January. Early in month, all 3 were present; by mid-month, only 2 remained; by month's end, only one. Pacific ocean perch (about 8,000-10,000 pounds) were seen on one deck.

OFF ALASKA

Soviet: The number of vessels fishing increased from about 75 in early January to about 110 at month's end. This increase resulted from buildup of flounder fleet in eastern Bering Sea, and beginning of herring fishing in central Bering Sea.

The Soviet Pacific ocean perch fishery in the Gulf of Alaska was confined to coast of southeastern Alaska in eastern Gulf throughout January. The number of vessels increased from 15 factory stern trawlers (BMRT's), 1 medium refrigerated side trawler (SRTM) and 1 base ship in early January--to 15 BMRT's, 2 SRTM's, 1 base ship, 1 tanker, and 2 other vessels by month's end. In previous years, SRT side trawlers were primary fishing vessels. During previous winters, 50-100 side trawlers were active in the Gulf.

While the number of vessels now used in the Gulf is considerably less than in previous years, the fishing capability is about the same. This is because catch rate of present vessels is three times that of smaller side trawlers.

The flounder expedition in the eastern Bering Sea, which began December 1967, increased from about 50 vessels in early January to about 70 by month's end. Soviet sources reported about 400 metric tons were caught each day in eastern Bering Sea in first 10 days of January. Presuming that about 40 of the 50 vessels in early January were trawlers, this would mean a daily catch of 10 tons per trawler.

Soviet sources reported that an SRTM was dispatched to central Bering Sea in early January to explore for herring. In mid-January, the vessel caught 20 tons of herring in one day. It was joined by "columns" of large fishing vessels (presumably BMRT's). Also, daily catches of individual BMRT's exceeded 30 tons. At least a dozen trawlers engaged in this fishery in January.

A fleet of 6-12 SRTM freezer trawlers engaged in deep-water trawling north of Fox Islands in eastern Aluetians. Similar expeditions were conducted by SRTM's in this area in 1967. Observed catches were primarily sablefish and arrowtooth flounder.

Japanese: The number of vessels off Alaska dropped from about 50 in early January to about 35 just after mid-month, and then increased to about 44 at month's end.

The Gulf of Alaska ocean perch fishery was continued at a low level. This has been pattern of previous winters. The Japanese effort, like the Soviets', was confined to eastern Gulf throughout January. Two factory trawlers fished off southeastern Alaska coast and two on Yakutat grounds during most of January. At month's end, only one vessel was fishing. Joining her was another factory trawler. Also arriving at month's end was a small factory trawler that began fishing on Yakutat grounds.

Four factory vessels, accompanied by about 38 trawlers, fished in eastern Bering Sea during first half of January. These fleets fished primarily on and along edge of Continental Shelf, just north of Unimak Island. They caught Alaska pollock, gray cod, and flounders, which were processed primarily by freezing. About mid-month, 2 fleets returned to Japan. The 2 remaining fleets shifted to Alaska pollock grounds north of Fox Islands in eastern Aleutians where they remained for rest of month. By January's end, one factory trawler had returned from Japan and began operations southeast of Pribilof Islands. It was accompanied by about 8 trawlers that caught Alaska pollock and flounder.

Early in January, 3 independent factory trawlers fished on Continental Shelf just north of Unimak Island. They caught flounders (yellowfin soles), which were frozen. By mid-month, they had been joined by 2 more factory trawlers; all 5 fished along 100-fathom curve between Unimak Pass and Pribilofs. They caught mainly Pacific ocean perch. These vessels continued fishing during remainder of month; late in January, they were joined by another trawler.

Six Japanese long-line vessels fished for sablefish in the Gulf of Alaska. During first 3 weeks, 2 long-liners fished off southeastern Alaska, and one was located off Kodiak Island. Late in January, the latter vessel moved to off southeastern Alaska, and the other two returned to Japan. Three other long-liners began operations off southeastern Alaska late in January.

STATES

California

FISHERIES ARE PART OF EDA STUDY FOR SAN DIEGO

A 3-phase, 18-month study aimed at providing new jobs in ocean-oriented industries in San Diego, Calif., was announced by the Economic Development Administration (EDA). EDA approved $115,000 in technical assistance funds for the study.

The money was requested by San Diego's Community Development Department. The City will add $10,000 to the EDA funds.

The first phase will take 6 months. It will determine the feasibility of establishing a tuna cold-storage plant and cannery, and a fish-meal processing plant. San Diego officials estimate that successful operation of such facilities could provide 400 to 1,000 new jobs in the area. It also will include a survey to see whether it is possible to set up a fishermen's cooperative for marketing and other services. This could increase annual income of fishermen.

Second and Third Phases

A second 6-month phase will determine the practicability of plants to process goods that now cross San Diego docks when entering or leaving the U. S. The survey will determine what items could be processed to reduce bulk, such as making plywood from logs, or compressing unrefined chemicals.

The final phase will start at the same time as the second and take about one year. It will involve compiling a list of the types of ocean-oriented firms with the best potential for creating jobs. It also will prepare a master plan for establishing firms.

* * *

ANCHOVIES DOMINANT IN PELAGIC FISH SURVEYS

During 1967, 8 pelagic fish surveys were made in the California Current system from the Oregon border to Magdalena Bay, Mexico, reports The Resources Agency of California. Most of the effort was concentrated in southern and central California waters. The principal survey methods were echo-sounding transects and midwater trawling.

Anchovies dominated all other species in numbers and in biomass. They were distributed in quantity everywhere but north of San Francisco. The surveys indicate that southern California is a major population center with a seasonal peak abundance in spring, when the adult population concentrates for spawning.

In central California, the anchovies were very large adults. Their distribution is seasonal. The largest quantities occur in summer and fall, and there is a marked scarcity in winter and spring. The echo-sounder surveys, along with tagging, indicate that these fish migrate in and out of this area from southern California.

Off Central Baja California

A second anchovy population center was found off central Baja California, Mexico. The Resources Agency believes there is strong evidence that these fish are a separate population from the California fish. Although the size of this population has not been determined, it appears about the same as the California population.

In spring, the behavior of anchovies in southern California is favorable for conducting a quantitative survey with echo-sounding transects. A June 1967 survey produced an estimate of 1.8 million schools. If the size of these schools could be determined accurately, a reasonable estimate of total population size could be made.

Lanternfishes were the second most abundant fishes. They were distributed widely--but nowhere abundantly, or concentrated. Sardines were detected and sampled only in Baja California. No large quantities were found, nor was there evidence of a strong incoming year class. Pacific mackerel were very scarce in all regions surveyed.

Florida

EDA APPROVES FUNDS TO DEVELOP JOBS IN FISHING INDUSTRY

The Economic Development Administration (EDA) has approved $150,000 in technical assistance funds to help develop methods of canning and marketing mullet, mackerel, and bonito in order to create new jobs in the southern fishing industry. A seafood firm in Miami, Fla., was the applicant.

Principal Species

The firm will conduct an 18-month project in cooperation with Florida and BCF. At present, mullet, Spanish and king mackerel, and bonito, which will be the principal species studied, are not being fully utilized. Successful processing and marketing programs for these species would create jobs in food plants and the fishing industry in Florida and other southern States.

Total cost of the project will be $232,500. Florida and BCF will invest some funds to cover services to complete the financing. The applicant's plant and other facilities will be used to conduct the project.

Aspects of Study

The funds will permit continuous fish processing to develop methods and standards for cannery operations. The project also will include preparation of recipes and demonstrations for dieticians and others responsible for preparing food in institutions. Further, the most profitable use of byproducts from the food processing will be determined.

BCF had reviewed proposal and recommended it to EDA.

* * *

GREATER USE OF CALICO SCALLOP BEDS EXPECTED

Increased commercial utilization of large, underutilized calico scallop beds off Florida's east coast is expected. During September-December 1967, 5,035 bushels of scallops were landed by 4 vessels at St. Augustine and Port Canaveral.

On Feb. 1, 1968, at least 5 more vessels fishing for processors in Georgia and North Carolina were getting ready to enter this fishery.

In 1967, the calico scallop catch off North Carolina dropped. This increased interest in developing the Florida beds, which were outlined first by BCF exploratory surveys in 1959-60.

Texas

FPC PILOT-RESEARCH PLANT AT TEXAS A & M

A fish protein concentrate (FPC) pilot-research plant is operating at Texas A & M University. The plant is wholly funded by Sweco, Inc., Los Angeles. It is operated jointly by Sweco and the University's chemurgic research laboratory.

Objectives

The FPC pilot plant will work toward these objectives: (1) Determine plant design and equipment specifications for future large-volume commercial production of FPC. It will use a single solvent (isopropyl alcohol) extraction process; (2) produce sufficient test quantities of FPC to be incorporated into food and for market evaluation studies by interested industries; (3) investigate feasibility of using a variety of fish for commercial production of FPC; and (4) conduct intensive test program to determine most economical method to produce high-quality FPC on a mass-production basis. ("Oil, Paint & Drug Reporter," Jan. 29, 1968.)

Oregon

FIRST STATE-U. S. FINANCING OF SALMON HATCHERY

The Oregon Fish Commission has awarded a $402,729 contract to construct the first salmon hatchery financed jointly by the State and the U. S. The Federal funds were authorized under the Anadromous Fish Act, P. L. 89-304.

The hatchery, scheduled for completion in October, will be on Elk River, Curry County,

near Port Orford. It will have potential rearing capacity of 2 million salmon a year for release in southern coastal streams.

In coho salmon, this release will produce an estimated 15,000 spawners, and a catch of 45,000 fish.

Oregon-Washington

FALL CHINOOK FROM U. S. HATCHERIES PLANTED IN WILLAMETTE

Interior Department's Fish and Wildlife Service planted 8,000,000 baby salmon in tributaries of the Willamette River early in February. It was part of a continuing effort by U. S. and State agencies to establish a run of Fall Chinook there before the Willamette Falls fishway at Oregon City is completed.

This spring, about 1,500,000 Fall Chinook now being raised at Eagle Creek National Fish Hatchery also will be released into the Clackamas River, a Willamette tributary.

Donald Johnson, BCF Regional Director, reported that 1,000,000 of the fry and fingerlings were transported by trucks from Little White Salmon National Fish Hatchery, and 7,000,000 from Spring Creek National Fish Hatchery, both in Washington State. BCF pays for both hatcheries, which are operated by the Bureau of Sport Fisheries and Wildlife.

Oregon and Washington Cooperate

The Washington Department of Game and the Oregon Game Commission provided tank trucks to help move the large amount of baby fish. About 400,000 small fish were transported in each truckload. Research personnel of the Fish Commission of Oregon helped select appropriate release sites.

The baby salmon were released at various points in the Molalla, South Santiam, Little North Fork Santiam, North Santiam, and Clackamas Rivers.

The fish stay in these tributaries for a short period, then begin swimming down the Willamette, into the Columbia, and finally into the Pacific Ocean. Survivors will return in 3 or 4 years as mature fish. They will spawn in the streams where they were planted.

The fishery agencies that conducted the planting program hope that eventually an annual run of 100,000 Fall Chinook will be established to pass the Oregon City Falls via the improved Willamette Falls fishway.

Fishermen May Benefit

Johnson said: "We are complementing the planting of Fall Chinook by the Fish Commission of Oregon with this release of the fish from the national hatcheries. On the basis of returns through the partially completed fishway of earlier releases of Fall Chinook salmon, this program of stocking hatchery fry and fingerlings appears to be paying off."

He said establishment of a self-sustaining run of Fall Chinook in the Willamette River would add greatly to the commercial and sport fishery. Fishery agencies hope that pollution problems in the lower Willamette will be resolved by the time the fish come back from the ocean.

Virginia

VIMS SCIENTISTS TAG STRIPED BASS

Fishery scientists of the Virginia Institute of Marine Science (VIMS) at Gloucester Point, Va., are tagging striped bass (rockfish), an important sport and commercial fish along the mid-Atlantic seaboard. During the first half of February, 1,500 stripers 6 to 30 inches long were tagged and released in the York River. In the third week, the scientists shifted to the Rappahannock River to begin tagging there as soon as the river is ice free.

"The tagging will be spaced over the biological year of the fish," said Dr. Edwin B. Joseph, Assistant Director of VIMS. The present effort is to locate and tag fish before they reach the spawning grounds in spring. The next major tagging program is scheduled for just after the spawning season, when many adult fish are returning from fresh water just above the brackish part of the rivers. The third tagging effort will take place in the fall.

"The success of these tagging programs will depend largely on the cooperation of both

sport and commercial fishermen returning tags recovered from the fish they catch," Dr. Joseph emphasized.

The tags being attached to striped bass are yellow, plastic discs, about ½-inch diameter. On one side, there is an identifying number; on the other, "Return tag to VIMS, Gloucester Point, Virginia 23062, REWARD." One dollar is paid for each tag returned.

What Tags Can Tell

Returned tags help scientists answer such questions as: "Where within a river system do specific populations of fish move?," "Does one population of fish intermingle with another?," "Do specific fishing methods select fish of given size and age?," "What proportion of the total catch is taken by sport-fishermen and by each type of commercial fishing gear used?," "How many fish of each age group die each year during the pre-migratory phase of their life?," "What is the relative proportion of fish of each year-class (fish of the same age) in the total catch?"

The answers help marine scientists develop management plans to ensure the best use of this valuable resource.

The work is supported in part from Federal and state funds. It is a cooperative study of VIMS scientists and the U. S. Bureau of Sport Fisheries and Wildlife.

New York

7½-FOOT STURGEON FOUND IN HUDSON

Optimists interpret the finding of a 7½-foot sturgeon in the Hudson River as a sign that the valuable fish has come home after a half-century Odyssey. No one is sure why it left, but overfishing and pollution are mentioned most often.

The Hudson River Valley Commission reported the killing of the 7½-foot female Atlantic sturgeon by a Verplanck, N. Y., fisherman who used his boat's propellers to do it. The sturgeon contained over 50 pounds of roe.

Other Sturgeon Reported

The November 1967 issue of "Sea Secrets," published by The International Oceanographic Foundation of Miami, Fla., stated: "Large sturgeon have been reported at other places on the Hudson over the past few years, and some have even been hooked, although these escaped because the anglers did not have the

extremely heavy gear necessary to land such fish. There has been no commercial sturgeon fishery on the river since the turn of the century, when the stocks vanished in the face of overfishing and pollution. Before that, 'Albany beef,' as the sturgeon were called, was a major resource of the Hudson Valley. Sturgeon are the source of what is probably the most valuable of fishery products--caviar. In one peak year the sale of Hudson caviar reached $6 million. If the sturgeon return in force to the Hudson, a resurgent fishery will go a long way towards defraying the cost of cleaning the river."

The Giant Fish

The salt-water sturgeon is a toothless, bottom-feeding fish found in the world's non-tropical seas. In the spring, it arrives in rivers to spawn; it may remain all summer. Species similar to the sturgeon have become landlocked in fresh water.

In the Soviet Union, there is a large demand for the roe, or eggs, of sturgeon as caviar.

Maine

CANNED SARDINE STOCKS LOWER AS 1968 BEGAN

Canners' stocks of Maine sardines on Jan. 1, 1968, were down 16,000 cases from a year earlier and sharply lower than in the two previous years. This was reported by the Census Bureau.

Type	Unit	1/1/68	1/1/67	1/1/66	1/1/65
Distributors	Actual Cases	222,000	232,000	267,000	238,000
Canners	Std. Cases1/	339,000	355,000	520,000	538,000

1/100 3¾-oz. cans equal one standard case.

Light 1967 Pack

The 1967 pack totaled 1,181,000 standard cases, compared with 1,2770,000 standard cases packed in 1966, according to the Maine Sardine Council. The light 1967 pack was due mostly to extended periods of bad weather and generally poor spring fishing. In 1967, as in 1966, 23 canning plants operated during the year. One plant has since been dismantled.

The Council has reported that the 1968 pack to February 10 was 83,000 standard cases. This compares with 68,000 cases for the 1967 period. Fishing by purse seiners was reported good and weather favorable. Fifteen canning plants were operating.

Alaska

THE FISHERIES IN 1967

The 1967 commercial catch of fish and shellfish totaled about 370 million pounds live weight, reports BCF Juneau. The value to fishermen was about $47 million. This is the lowest catch since 1960's 359 million pounds worth $41 million.

The 1967 catch was 36 percent less in volume and 42 percent less in value than the 1966 landings of 582 million pounds valued at $81 million.

The marked decline in 1967 landings was due to greatly reduced catches of salmon, king crab, and herring--together down 237 million pounds from 1966. For the first time in history, the volume of salmon landings--131 million pounds--was overshadowed by another species--135 million pounds of king crab.

Estimates of 1967 Year-End Catch and Value

Species	1967 1/		1966	
	Quantity	Value	Quantity	Value
	1,000 Lbs.	US$ 1,000	1,000 Lbs.	US$ 1,000
Halibut	33,000	5,000	33,354	7,774
Herring	9,500	140	19,256	289
Sablefish	348	42	2,311	273
Salmon:				
King	10,300	3,200	9,350	2,949
Red	52,300	11,000	92,767	19,737
Coho	12,400	3,800	16,113	3,705
Pink	26,700	3,500	162,866	22,093
Chum	29,300	3,300	52,230	5,718
Total	131,000	24,800	333,326	54,202
Misc. Fish	266	45	150	26
Herring Eggs on kelp	378	285	662	496
Crabs:				
King	135,000	13,500	159,202	15,670
Dungeness	11,500	1,380	5,053	606
Tanner	80	8	-	-
Shrimp	46,300	1,852	28,193	1,288
Clams	120	12	29	9
Grand Total	367,492	47,064	581,536	80,633

1/Preliminary data supplied by Alaska Department of Fish and Game.

Several Bright Spots

Despite the reduction in overall landings, there were several bright spots. Dungeness crab landings totaled 11.4 million pounds, up 130 percent from 1966. Shrimp landings were a record 46.3 million pounds, up 60 percent. Tanner crab landings, though only 80,000 pounds, also were a record. Salmon roe production is estimated at 6 million pounds with a raw product value of $1 a pound. This is over 50 percent of the value of the U. S. Pacific halibut fishery.

Commercial Scallops

Scallops were landed for the first time commercially in December 1967. "The resource is estimated to be large, the product is rated excellent, and the price is the highest in history."

The port of Kodiak had landings of 111 million pounds worth $10 million. It dropped from third to fourth place among U. S. ports in value of fishery landings. It was behind San Pedro, Calif., $29.5 million; Brownsville, Texas, $16.5 million; and New Bedford, Mass., $15.7 million; it was ahead of Boston, $9.4 million.

BUREAU OF COMMERCIAL FISHERIES PROGRAMS

Chemical Control of Oyster Predators Pays Off

Chemical methods are showing convincingly their commercial value in controlling oyster predators in New Haven Harbor, Conn. About 250,000 bushels of oysters from the 1966 spatfall, planted on about 200 acres of bottom, are being treated with lime for starfish control. Also, granular Polystream is being used to control oyster drill.

Losses of oysters to starfish and drill during May-November 1967 were 4-5 percent. This compares with over 50 percent loss for untreated grounds with similar oyster plantings. There was a total loss of the 1958 commercial oyster set to predators before the end of its first year.

Milford Lab Methods Used

The 1967 achievement was the first large-scale commercial demonstration of the effective control methods developed at BCF's Milford (Conn.) Laboratory. It shows the importance of these methods to a successful mariculture system for oysters.

Such routine treatment of oyster grounds can be expected to increase production from the usual 1 to 1 per bushel of seed planted to an 8-10 to 1 per bushel planted over the $3\frac{1}{2}$-year period required to reach harvest size.

Long Island Fishery May Benefit

This is a considerable economic return over planting without chemical controls. Combined with hatchery production of seed and 1966 commercial set, it may contribute to a resurgence of Long Island's oyster fishery.

Collapsible Lobster Pot Is Suited for Continental Slope Fishing

Personnel of BCF's Gloucester (Mass.) Exploratory Fishing Base have built a prototype collapsible lobster pot of a size suitable for fishing on the Continental Slope.

When opened, the pot is 3 x 4 x $1\frac{1}{2}$ feet. It collapses to 3 feet x 4 feet x $3\frac{5}{8}$ inches. Five folded pots can be stored in the exact space taken by one opened pot. This will be important when transporting many pots a considerable distance from port to fishing grounds.

3 'Heads' In Pot

The pot has a valuable feature: 3 "heads." Only the ties at the end of the "skate" head leading into the "parlor" section need to be modified to make trap collapse quickly and easily. This can be done by using elastic or spring-loaded ties--or through quick-detaching method for clipping ties to pot frame, as used on prototype pot.

These Lobsters Prefer Artificial Reef as Home

An artificial reef built over a year ago near the mouth of Boothbay Harbor, Maine, has 6 times more lobsters on it than are present in the adjacent natural habitat--and 12 times more than colonized it during its first year.

In November 1966, personnel of BCF's Boothbay Harbor Laboratory completed the artificial reef to provide a habitat for lobsters under study. The reef covers about 10,000 square feet of bed rock, cobble, and mud-covered ocean bottom in 50 to 80 feet of water.

Monthly throughout 1967, the lab's SCUBA team observed and counted the reef's inhabitants. A few lobsters moved onto the reef during the first 2 weeks and, since then, the population has increased steadily.

A year after construction, in November 1967, observations showed the apparent density of lobsters about half that in adjacent natural habitat--and 3 times that existing on the reef's site before it was built.

Population Booms

Since its November report, the SCUBA team has reported "a dramatic increase in the relative apparent density of lobsters"--6 times more than are found in adjacent natural habitat and 12 times more abundant than during reef's first year.

The reef lobsters have been joined by scallops, sea urchins, anemones, starfish, cunners, sculpins, rock eels, cod and redfish. Colonial hydroids are abundant on the exposed rock surfaces. The siltation level is where it was 2 months after reef was built.

The reef is open to commercial lobster fishing. About 10 to 15 traps have been set on or adjacent to it.

Aid to Florida's Thread Herring Fishery

On Feb. 5, a Florida State court lifted the ban on the developing thread herring fishery off the State's west coast. The fishery had started well in 1967, but the State closed it when it decided to enforce a law prohibiting the incidental catching of food fish.

The large, unused thread herring resource is a valuable alternative for the menhaden industry.

The staff of BCF's Biological Laboratory at St. Petersburg Beach presented data at the court hearings that food fish were less than one percent of the catches. BCF's thread-herring biological research program, which developed the data, already is considered a good investment. BCF's new research vessel, "Oregon II," has been helping the fishing fleet find and catch the fish.

Aid to A.I.D.

Two BCF experts served as members of a survey team sent to Africa by the U. S. Agency for International Development (AID) to explore the problems of producing, distributing, and marketing fish protein concentrate (FPC).

The two were John Dassow, Food Technologist of the Seattle Technological Laboratory, and Ben Jones, Director of the Juneau (Alaska) Exploratory Fishing and Gear Research Base. They accompanied Roy Christey, Program Coordinator of AID's Food From The Sea Service. The team visited Morocco, Uganda, Ghana, and bases on Lake Victoria.

The BCF specialists reported their findings to the State Department on Feb. 16.

"Oregon" Surveys Midwater Schoolfish

BCF's exploratory fishing vessel Oregon returned to St. Simons Island, Georgia, on Jan. 21 after completing the first in a series of 6 bimonthly midwater schoolfish survey cruises.

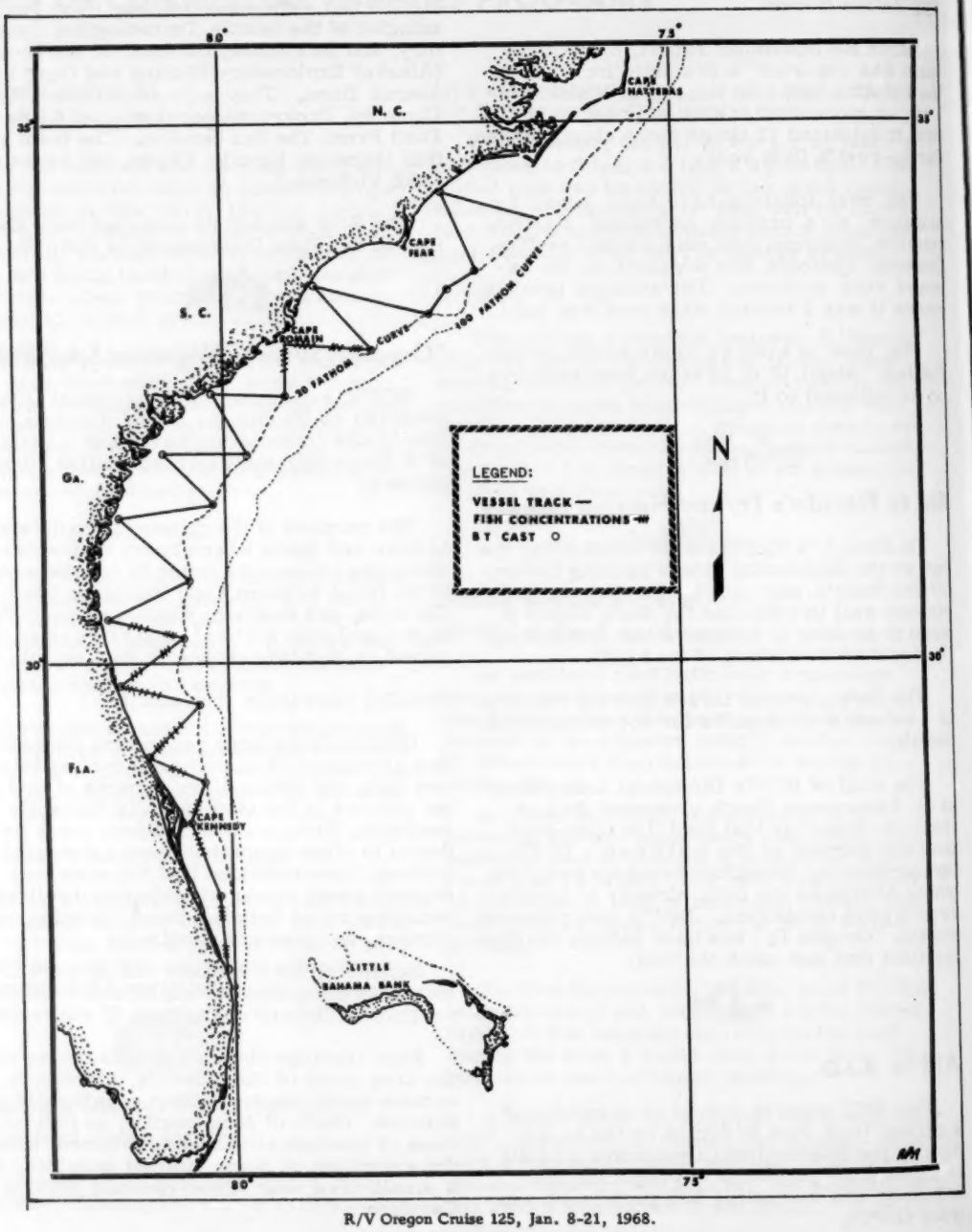
The purpose of the cruises is to determine in time and space where heavy mid-water schooling phenomena occur in coastal waters (5-20 fms.) between Cape Hatteras, North Carolina, and southern Florida by analyzing high-resolution vertical echo tracings obtained on standard transects (see chart).

Detailed Knowledge Unavailable

Detailed knowledge concerning the relative abundance of commercial concentrations and daily and seasonal movements of midwater species in the study area is currently unavailable. Frequent observations made incidental to other operations, and a few trial catches, have indicated that the area may support heavy stocks of midwater dwellers, including round herring, thread herring, anchovies, and possibly sardines.

Results of the 6 cruises will be used to establish guidelines for exploratory and experimental fishery operations, if warranted.

Echo tracings obtained on this cruise show the area south of Jacksonville, Florida, to contain heavy concentrations of midwater schools. North of Jacksonville, no indications of concentrations were obtained, with the exception of some limited schooling in a small area near Cape Romain, South Carolina.



R/V Oregon Cruise 125, Jan. 8-21, 1968.

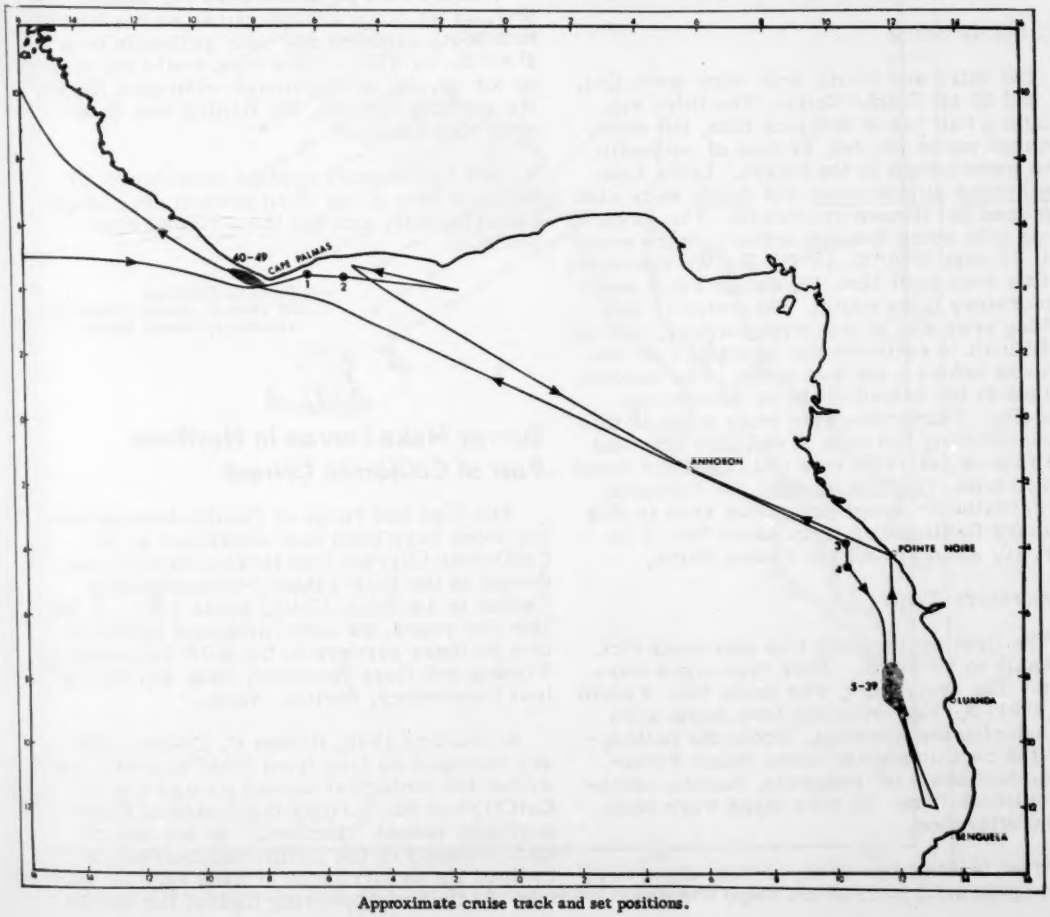
Purse Seining Off Africa's West Coast

From Oct. 2, 1967, to Dec. 6, 1967, I was a BCF observer aboard the M/V "Caribbean," which purse seined for tuna off the west coast of Africa. The 167-foot vessel has a net about 575 fathoms long and 48 fathoms deep, a seine skiff 34 feet by 19 feet, 2 speed boats, and a helicopter. It has a capacity of about 800 tons of tuna in 14 brine tanks. The helicopter played a great part in the trip's success. It located most of the tuna schools and helped in the setting of the net by radio communication with the vessel.

The helicopter not only helped the Caribbean but also 2 other U. S. seiners: "Southern Seas" and "Day Island." We were in constant communication with these vessels and spotted tuna for them as much as possible.

First Set off Cape Palmas

The vessel left San Juan, Puerto Rico, Oct. 2. Final preparations for fishing were made while crossing to Africa and were completed by Oct. 14. The first set was made on a school of skipjack tuna (Katsuwonus pelamis) showing at the surface near Cape Palmas during the morning of Oct. 15; it was unsuccessful. A strong current caused the cork line to sink and made it possible for the tuna to go over the net. A second set made later in the day caught 30 tons of skipjack tuna and some frigate mackerels and bullet mackerels (Auxis thazard and A. rochei), which were



Approximate cruise track and set positions.

thrown overboard. No tuna signs were seen the next 2 days so we proceeded to Annobon Island.

On Oct. 18, the Caribbean's captain talked to the captain of a French combination purse seine-bait boat. The latter reported that the French fleet was fishing off Angola and making fairly good catches of yellowfin tuna (Thunnus albacares).

We arrived off Annobon Island on Oct. 20. A few tuna schools were seen around the island, but they would not stay up so that a set could be made. Because the bottom was rough, the captain did not want to chance losing the net so early in the cruise. We then headed for the coast of Angola in search of the French fleet.

Off Pointe Noire

The third and fourth sets were made Oct. 21 and 22 off Pointe Noire. The third set caught a half ton of skipjack tuna, but most escaped under the net; 40 tons of yellowfin tuna were caught in the fourth. Little tuna (Euthynnus alletteratus) and Auxis were also captured but thrown overboard. The French, along with some Spanish seiners, were seen Oct. 23 near 9°00' S., 12°00' E. We remained in this area until Nov. 10, except for 2 short exploratory trips south. The water in this fishing area was of low transparency, making it difficult to estimate the tonnage of the schools before a set was made. The species of tuna in the school could be determined visually. Thirty-five sets were made in this area, catching 249 tons of skipjack tuna and 325 tons of yellowfin tuna (this includes some bigeye tuna, Thunnus obesus). A Japanese purse-seine 5-vessel group was seen in this primary fishing area from about Nov. 8 to Nov. 10, when we left for Pointe Noire.

Exploratory Trips

The first exploratory trip was made Oct. 24 south to 10°38' S. Poor tuna signs were seen. The second trip was made Nov. 8 south to 12°01' S. Fair skipjack tuna signs were seen during the morning. From the helicopter, the captain sighted some small Portuguese bait boats off Benguela, Angola, catching skipjack tuna. No tuna signs were seen in the afternoon.

After leaving this area, no tuna signs were seen again until Nov. 17 off Cape Palmas. Ten sets were made from Nov. 17 to Nov. 21 (8 were on porpoise--common dolphin, Delphinus delphis schools--) and caught 89 tons of yellowfin tuna. The water off Cape Palmas was generally blue and clear. The yellowfin tuna swam beneath the porpoise schools (this could be seen from the helicopter) and made it difficult to determine the tonnage before the sets were made. The 2 speed boats and helicopter were used to herd the porpoise and thus the tuna into the net. Some sets were made without seeing any tuna with the porpoise. The 2 sets not made on porpoise captured only little tuna and Auxis. The yellowfin were all of the larger size (950 mm. fork length and above). No skipjack tuna or bigeye tuna were captured in this area.

We left Nov. 22 and headed for Dakar. On Nov. 23 we observed one purse seiner and 3 bait boats catching one-pole yellowfin tuna at 8°40' N., 14°36' W. The tuna would not stay up for us, so we continued on toward Dakar. We arrived Nov. 25. No fishing was done after this date.

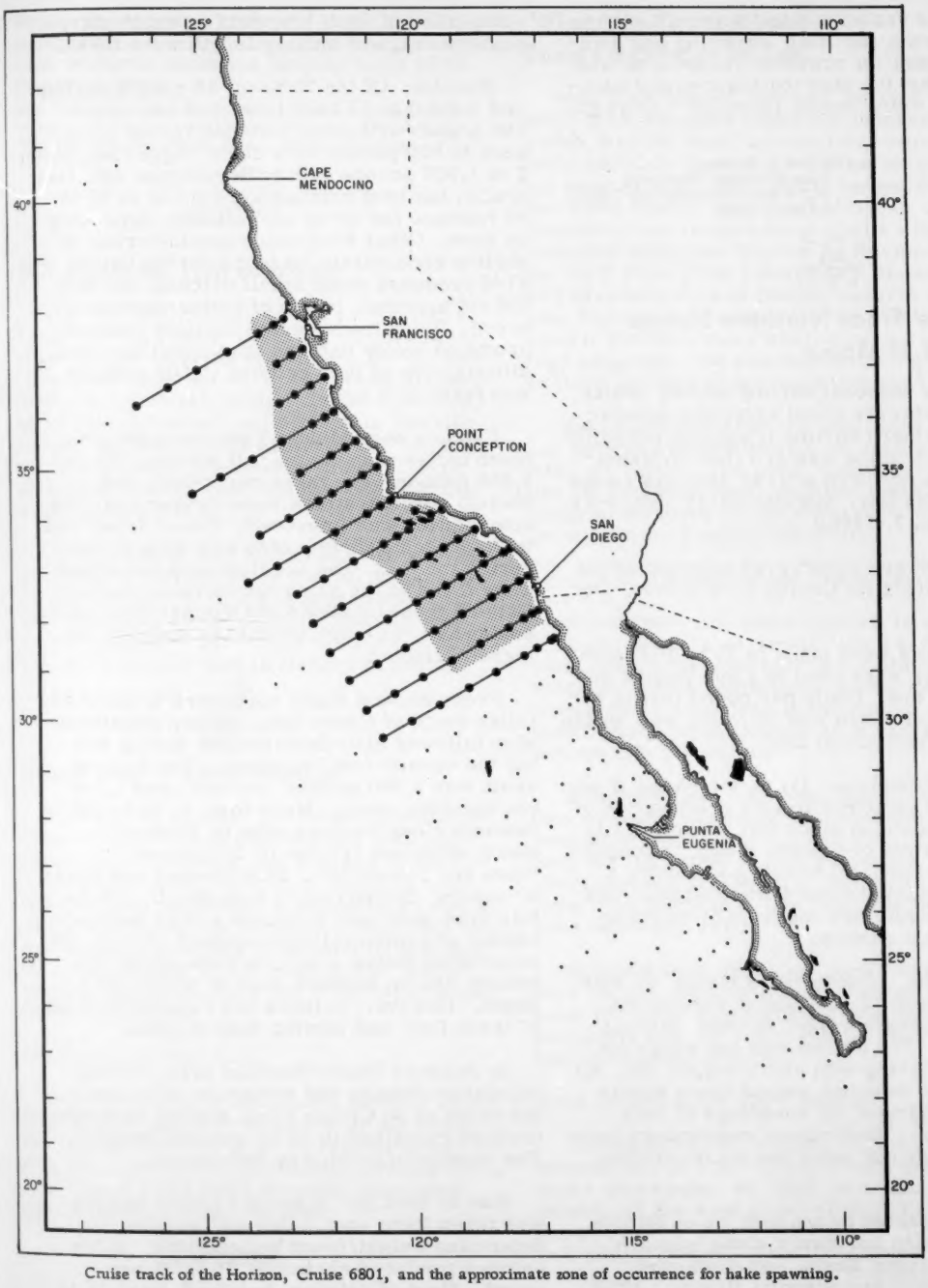
The Caribbean's captain considered all skipjack tuna under about 400 mm. fork length unmarketable, and had them thrown overboard.

--By David C. Simmons,
BCF Tropical Atlantic Biological Laboratory, Miami, Florida

Survey Hake Larvae in Northern Part of California Current

The size and range of Pacific hake spawning stock have been best described by the California Current fish larvae surveys conducted at the BCF Fishery-Oceanography Center in La Jolla, Calif., since 1951. In the last few years, we have furnished information on these surveys to the BCF Exploratory Fishing and Gear Research Base and Biological Laboratory, Seattle, Wash.

In January 1968, Robert C. Counts, fishery biologist on loan from EASTROPAC, conducted the biological survey program of CalCOFI on the Scripps Institution of Oceanography vessel "Horizon." At the end of each transect of the California Current, he radioed the occurrences of hake eggs or larvae. In the accompanying figure, the cruise



Cruise track of the Horizon, Cruise 6801, and the approximate zone of occurrence for hake spawning.

track of the vessel and the approximate zone of occurrence for hake spawning are indicated. Based on previous records, it was expected that the distribution area and intensity of spawning would increase through February.

--By Paul E. Smith,
Fishery Biologist (Research)
BCF Fishery-Oceanography Center,
La Jolla, Calif.

'Delaware' Finds Northern Shrimp in W. Gulf of Maine

During a seasonal shrimp survey cruise, the M/V Delaware found extensive populations of northern shrimp (Pandalus borealis) concentrated in the western Gulf of Maine--between the northern edge of Jeffreys Ledge and Cape Cod Bay. (Cruise 68-1: Jan. 6-19, Jan. 29-Feb. 7, 1968.)

The Delaware resurveyed selected areas explored during its Cruise 67-9 in Nov.-Dec. 1967.

Trawl tows were made in 30 to 109 fathoms; catches were zero to 1,900 pounds of shrimp per tow. Count per pound (heads on) for all shrimp taken was 30 to 60, well within range for commercial use.

Cruise objectives: (1) to determine if any changes had occurred in size composition of shrimp populations since fall survey, (2) to ascertain extent of change, if any, in magnitude and location, (3) to test and modify a new mechanical shrimp-fish separator, and (4) to investigate new methods of handling freshly caught shrimp.

Procedure: 70 tows were made: 67 with a roller-rigged 70-foot Maine shrimp net, and 3 with a chain-rigged 70-foot Maine shrimp net. The bottom was too rough for successful fishing with chain-rigged net. All tows were 60 minutes, except those shortened by "hang-ups" or soundings of very rough bottom. Preliminary exploratory tows with small try net were not made--unlike fall cruise.

Fishing started on western tip of Middle Bank, continued northward along western edge of Wilkinson Basin, and southward across Jeffreys and Scantum Basins. After completion of each tow, data on catch size, pound count, and shrimp length were taken.

Results: Of the 70 tows, 63 caught shrimp and 7 did not; 22 tows produced catches of 500 pounds or more. Catches varied from zero to 600 pounds with chain-rigged net, and 3 to 1,900 pounds with roller-rigged net. Generally, the best catches were made in 50 to 60 fathoms and 80 to 100 fathoms, depending on area. Other tows made outside areas of shrimp concentrations found during Cruise 67-9 produced some small catches, but they did not approach levels of better-producing areas. Tows made during daylight generally produced better catches than nighttime tows, although one of best catches (1,600 pounds) was taken at 4 a.m.

Catches near Middle Bank were large--much better than during fall survey. Up to 1,300 pounds were taken per 1-hour tow. Shrimp concentrations were denser and catch composition was improved. Fewer trash fish were present; shrimp size was larger than during the fall. The heaviest concentrations were found in the same locations in the fall. Outside these locations, the number increased somewhat--but not enough to support commercial fishing.

From Wildcat Knoll northward to about 25 miles south of Casco Bay, shrimp populations also followed distribution noted during fall, but the density had increased. The largest catch was 1,900 pounds; several over 1,000 pounds were made. Many tows in 80 to 100 fathoms along western edge of Wilkinson Basin produced catches of 500 pounds or more per 1-hour tow. In shallower and deeper waters, catches were very small. While this area generally supports a very good population of commercially excellent shrimp, its boundaries follow a narrow zone along 100-fathom line on western edge of Wilkinson Basin. However, catches are relatively clean of trash fish, and shrimp size is good.

In Jeffreys Basin-Scantum area, shrimp population density and structure were about the same as in Cruise 67-9; shrimp concentrations remained in same general location. The maximum catch was 700 pounds.

Size of Shrimp: A small random sample was taken from each catch and weighed to determine weight/count relationship. A few catches produced shrimp of 30 to 35 per pound. Most of catches, however, were 35 to

50 per-pound size shrimp. Length measurements were taken from selected samples at most stations; carapace lengths were 15 to 33 millimeters.

Note: For more information, contact Keith A. Smith, Base Director, or Phillip S. Parker, Fishery Biologist, EF&GR base, State Fish Pier, Gloucester, Mass., 01930, Telephone: 617-283-6554.

BCF Promotes Fish in Milan

The Bureau's Office of International Trade Promotion (OITP) took part in the Milan (Italy) catering show, Jan. 20-27, and stimulated interest in U. S. frozen fishery products. Several Italian firms said they would like to import and distribute individually quick frozen (IQF) oysters, IQF shrimp, breaded shrimp, breaded scallops, Dungeness crab meat, west coast cooked shrimp meat, and lobsters.

OITP reports that the considerable interest reflects an improving Italian economy. Latest figures for sales of frozen foods in Italy showed a 50 percent increase in the first 9 months of 1967 over the 1966 period. Half the increase was in fishery products.

Flying Fresh Fish to Market

To help the Pacific Northwest groundfish industry, BCF personnel worked with container manufacturers and airlines to develop an inexpensive, leakproof shipping container. They developed a satisfactory one in cooperation with the airlines. Then they conducted test marketing programs to evaluate the acceptability of the containers--and to develop inland markets for fresh west coast fishery products.

Air Ship 3 Million Lbs.

BCF's initiative stimulated several firms to ship fresh fishery products by air from the Pacific Northwest to midwestern, southern, and eastern retail outlets. During 1967, 3 million pounds were shipped, compared with practically none in 1966.

What We Know About Tuna's Behavior at Sea

Man has hunted several species of the swift and valuable tunas for thousands of years, but he has accumulated remarkably little reliable knowledge of the behavior of his prey at sea. Only within recent decades has there been a concerted effort to describe precisely how tunas behave in the wild. So reported biologist Eugene L. Nakamura of the BCF Biological Laboratory, Honolulu, to an FAO conference of fishery experts in Bergen, Norway, in October 1967. Nakamura is chief of the laboratory's behavior and physiology program. He was summarizing the literature on field observations of the tunas.

Nakamura found that the conditions of fishing have set sharp limits on man's knowledge of tunas. The most widely used methods of catching them require that they be hungry. So many of the observations about them concern feeding behavior.

Schools of Thought About Their Feeding

Sometimes, the tunas appear to seek out a single species of small fish as prey; at other times, they do not. Near Hawaii, for example, tunas sometimes appear to prefer fishes that live deep in the ocean, rather than surface-living fishes or baitfishes thrown into the water.

A hungry fish may bite poorly or well. One scientist has found that between the extremes of starvation and satiation, the less food the fish have in the stomachs, the less likely they are to bite well. But other scientists have found that fish with empty stomachs bite very well.

Skipjack tuna, the most plentifully caught tuna in the Pacific Ocean, display vertical bars on their sides during feeding. Some scientists say the catch will be good when the fish exhibit these bars.

Tuna School Sizes Vary Widely

Tunas travel in schools, which can vary enormously in size--from a half dozen to many thousands. In 1958, near San Benito Island, off the west coast of Baja California, purse seiners took 4,000 tons of bluefin tuna in a single school. This is about three-fourths the catch of the entire Hawaiian skip-

jack tuna fleet in a whole year. In 1966, a BCF research vessel near the Bahama Islands came across a school of bluefin tuna that required $2\frac{1}{2}$ hours to sail across.

Almost all species of tunas have been reported in mixed schools of two or more species, Nakamura says. But, according to researcher Heeny S. H. Yuen of the Honolulu Laboratory, these "mixed" schools probably are distinct schools of different species drawn together by a common stimulus, such as food.

In the eastern Pacific Ocean, the largest U. S. tuna fishery, skipjack tuna and yellowfin tuna often are caught together in purse seines. Scientists have found that the excitable skipjack, when captured, calmed down when placed in presence of less erratic yellowfin.

Schools of Same-Size Tuna

Schools of tuna usually consist of fish of the same size. Even if two or more species are present, the fish are about the same size. Probably, this is because they can maintain only a certain swimming speed.

A Japanese scientist has observed that schools of skipjack tuna that bite well maintain an orderly formation, like marching troops; those that bite poorly are "disorderly."

Some tunas school at night. Schooling is thought to be a function of sight. Nakamura thinks the fish can see well enough at night to school either from moonlight or light shed by luminescent organisms. Fishermen use the luminescence of planktonic organisms disturbed by fish.

Water Temperature A Factor

In the eastern Pacific, purse seining for tuna has been most successful when a shallow, upper, mixed layer of the sea has been underlain by a "thermocline" with a sharp temperature gradient. That is, the temperature drops off sharply within a few dozen feet. This sharp gradient is widely believed to deter tuna from sounding (diving) and escaping the nets. However, it may not be temperature alone that causes fish to avoid the thermocline. The water there often is turbid and, sometimes, there is perilously little oxygen in the layer.

Seek Floating Objects

Like many other fishes, tunas appear to seek out floating objects. Some scientists think they use them as "landmarks" in a largely featureless sea. Recently, other scientists have said that the chief purpose of the floating objects appears to be shelter. In any event, tunas often are found near logs, driftwood, floating vessels, even dead whales. Japanese scientists say that schools may wander as far as 7 or 8 miles from such an object and then return. "If this pelagic homing does occur," Nakamura says, "it implies that the tunas have some sort of navigational system."

Birds Aid Man

Birds are most helpful to man in finding tunas. In the central Pacific, and in some other areas, fishermen rely almost wholly on sighting bird flocks to locate tuna, Nakamura points out. "They even rely on the behavior of the birds to determine certain characteristics of the schools.... The number and spread of the birds are indications of school size. If the birds dive and circle fast and erratically, the fish are small. If the birds are seen diving into the water, the tunas have driven their prey to the surface and are feeding actively. If the birds scatter or sit on the sea surface, the fish have sounded."

The tunas are among the swiftest fish. Their measured speeds have ranged from 0.8 to 25 meters a second (2 to 56 miles per hour).

Honolulu Lab's Program

Nakamura is interested in the behavior of tunas at sea and in the lab. His group is concentrating now on two aspects of tuna behavior: their reaction to different species of live bait, and their subsurface distribution. The largest Hawaiian fishery--for skipjack tuna--uses as bait a local-to-Hawaii anchovy called nehu. The researchers are investigating possible alternate bait species for the anchovy.

To study the location of unseen tuna, his group uses a continuous-transmission, frequency-modulated sonar aboard one of the lab's research vessels. This sonar provides data on depth, direction, and speed of tunas.

ARTICLES

OCEANOGRAPHY'S ROLE IN DEVELOPING MARINE RESOURCES

By James H. Johnson*

Natural resources are developed in response to a present or projected need. Future economic and social needs for natural resources are strongly conditioned by the expected increase in world population. An examination of past statistics and projected trends in world population is sobering. In 1600, world population was about 350 million; by 1800, the figure had doubled; by 1900, it had doubled again and stood at about 1.5 billion. And again since then, the world's population has doubled itself. Within the next 35 years, if this rate of increase continues, there will be over 6 billion persons on earth. Though it has taken all the vast reaches of time to arrive at today's population of around 3 billion, it may take no more than 35 years to add the next 3 billion.

Clearly, if the world population continues to rise as projected, the demand for natural resources will intensify. It is not clear, however, just how much of the demand will be satisfied from resources in the marine environment. This environment, however, appears likely to play a significant role in supplying food, mineral, water, and recreational resources.

In general, the development of marine resources follows a similar pattern: Location - Description and Assessment - Extraction - Processing - Marketing.

This paper outlines future demands for food and describes some kinds of oceanographic data and programs needed to develop marine food resources. Emphasis is placed on the location, description and assessment, and extraction phases, though certainly processing and marketing are of equal importance for full development of the resource. Also, economic factors must be considered in all phases of development.

World Protein Shortage

Today, the limited quantity of food--in calories--is a great concern to many parts of the developing world, but the nutritive value--protein--is even more crucial. Supplies of protein are particularly scarce and costly in the poorer nations. The recent report of the President's Science Advisory Committee on the World Food Problem[1/] concludes:

"It is imperative for programs designed to alleviate protein deficiency to produce big results in a relatively short time. Since even the most vigorous efforts probably will fall short of the goal, work should be initiated promptly on any program which shows promise of possible significance."

Certainly none of the steps taken to date to solve this problem has been effective enough to halt the worsening trend. No adequate solution is in sight. President Johnson recently warned that the shadow of starvation and impending famine has grown even darker. He said it was necessary for the United States and other nations to make a massive effort to help the less fortunate of the earth help themselves.

The urgency of this problem can be demonstrated by the following factual highlights:

1. World population is expected to increase at a frightening rate.

2. Even today, at least 20 percent of the 2.25 billion people living in less-developed countries receive too few calories, and about 60 percent have diets inadequate in nutritional quality.

3. If present growth rates continue until 2000, there will be more than four times as

*Deputy Assistant Director for Biological Research, BCF. Article is based on paper presented at Ogden Oceanography Seminar, New York City, N. Y., Oct. 16, 1967, sponsored by Ogden Technology Laboratories, Inc.

1/Commercial Fisheries Review, August-September 1967, pp. 1-3.

U. S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 809

many people in the less-developed countries than in the developed ones.

4. If similar foods are consumed in the next 20 years, estimated protein and calorie needs mean that the world will need 50 percent more food in 1985.

5. The population-control effort does not offer much hope for solving the food supply problem in the near future.

6. Recent rates of growth in food production in the developing countries have been slower than those of consumption.

7. Poor distribution systems within and among countries make the situation even more disturbing.

In recent years there also has been a growing demand for fish and fish products in the United States, edible and non-edible. The per-capita use of fish and fish products increased from 42 pounds (round weight) in 1950 to 62 pounds in 1966. An estimate based on projections of population, income, and per-capita consumption is that total use of fish and fish products in the United States will increase to 28.1 billion pounds in the year 2000. This is 134 percent over the 12 billion in 1966.

Estimates of Potential Harvests

When one examines the rapid growth of fishery activity since World War II, and the expected increase in this activity to supply world demand, he wonders what the upper limits of fishery resources are that can be taken year after year. Over the past twenty years, production of living aquatic products has increased from about 20 million metric tons to about 50 million metric tons (Figure 1).

Estimates have been made in recent years on the possible sustained production from the oceans. These estimates are essentially of two types. One extrapolates present trends and success in areas now heavily exploited to like regions of the oceans yet unexploited. The other is based on food-chain dynamics--on the amount of phytoplankton produced naturally in the ocean, and the flow of energy through the food web to fish. Both have shortcomings. The former approach appears, on the average, to give estimates much below those of the latter.

At the Second Annual Marine Technology Society Meeting in Washington, D. C., June 1966, W. M. Chapman of Van Camp Seafoods, estimated that the ocean produces about two billion tons of marine animals each year that are large enough and useful enough to form the basis of a practical commercial effort.

Schaefer (1965) has estimated the harvestable crop from the net rate of photosynthesis of organic matter and its transfer through the food chain. He concludes that a minimum of 200 million metric tons of fishery products can be taken on a sustained basis--and that the figure appears reasonable and probably conservative. This agrees closely with the estimate in a 1962 publication of the National Academy of Sciences--National Research Council of 190 million metric tons that could be taken annually--or about four times that now taken.

On the conservative side, estimates made by some scientists at the International Conference on Fish in Nutrition, 1961, Washington, D. C., suggest that we may be approaching the upper limit of sustained production faster than we realize.

There is much need for further study on the processes governing ocean productivity to refine the estimates now being made. At present, however, the consensus seems to be that production from the sea can be increased significantly.

The greatest increases in catch are expected to come largely from the lower trophic levels. This expectation is already borne out by production figures of the last two decades (Figure 2) which show the greatest growth in fisheries from herringlike fishes. Peru's catch record provides an outstanding example of how the harvest of lower trophic level forms can catapult a nation into prominence in world fish production (Figure 3).

Oceanography's Role Increasingly Important

The role of oceanography in development of food resources will become increasingly important. Results of oceanographic surveys will provide understanding of ocean processes needed for more efficient means of locating new resources. Follow-up programs will be directed at stock assessment, including the determination of effects of environmental change on abundance and distribution of stocks, an understanding of which will lead to fishery forecasts. Concurrently, ocean engineering programs will be pursued for developing efficient harvesting techniques.

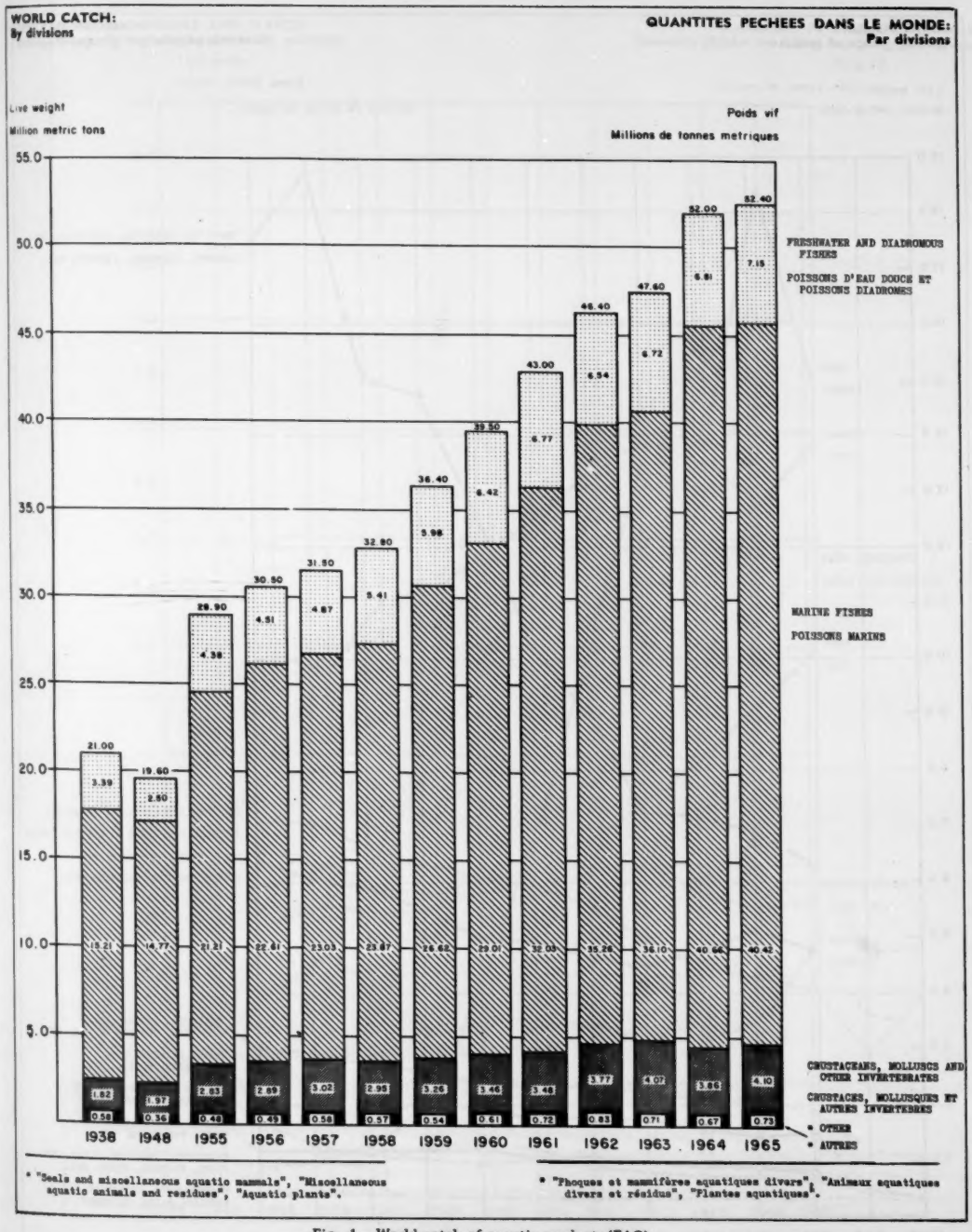


Fig. 1 - World catch of aquatic products (FAO).

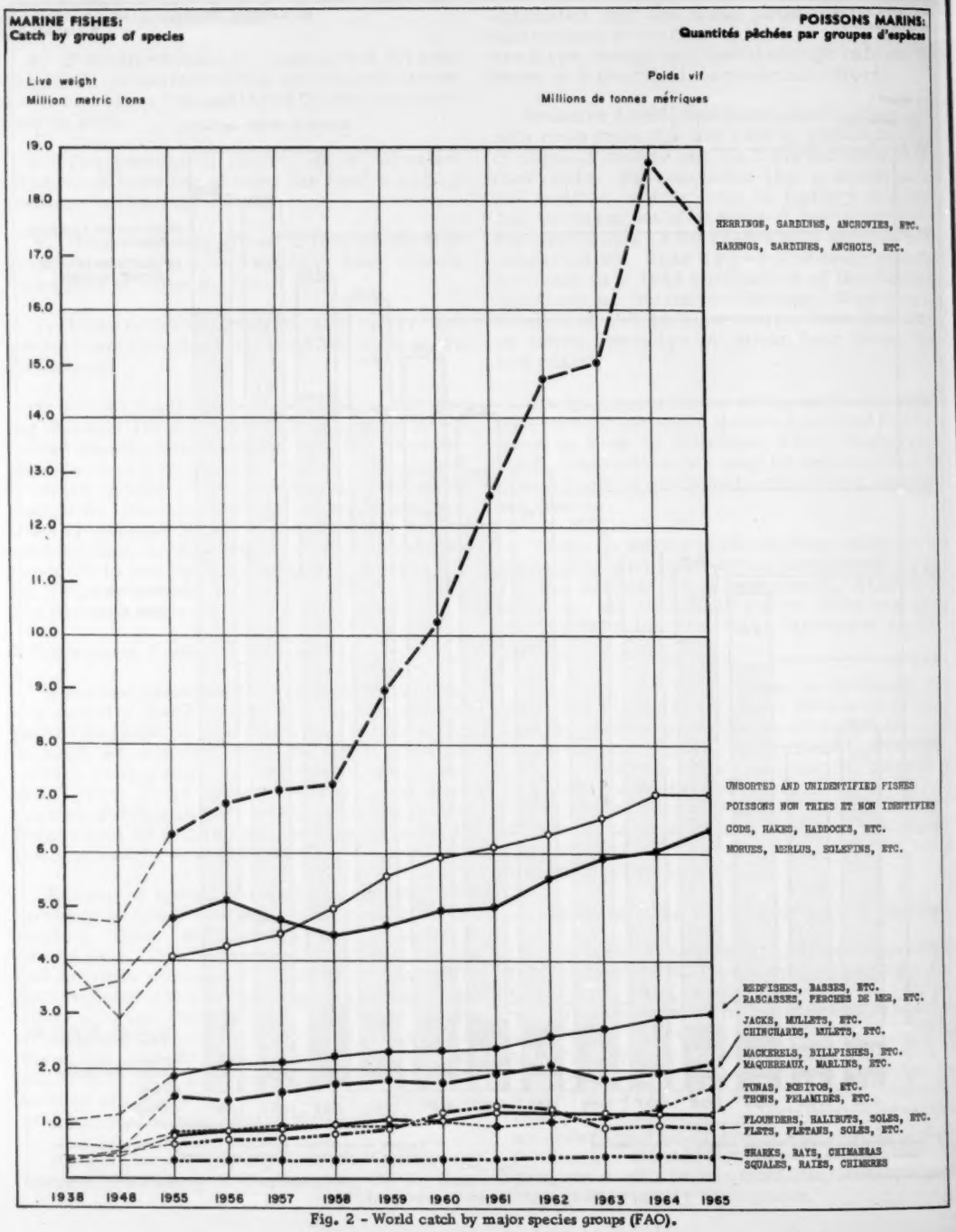


Fig. 2 - World catch by major species groups (FAO).

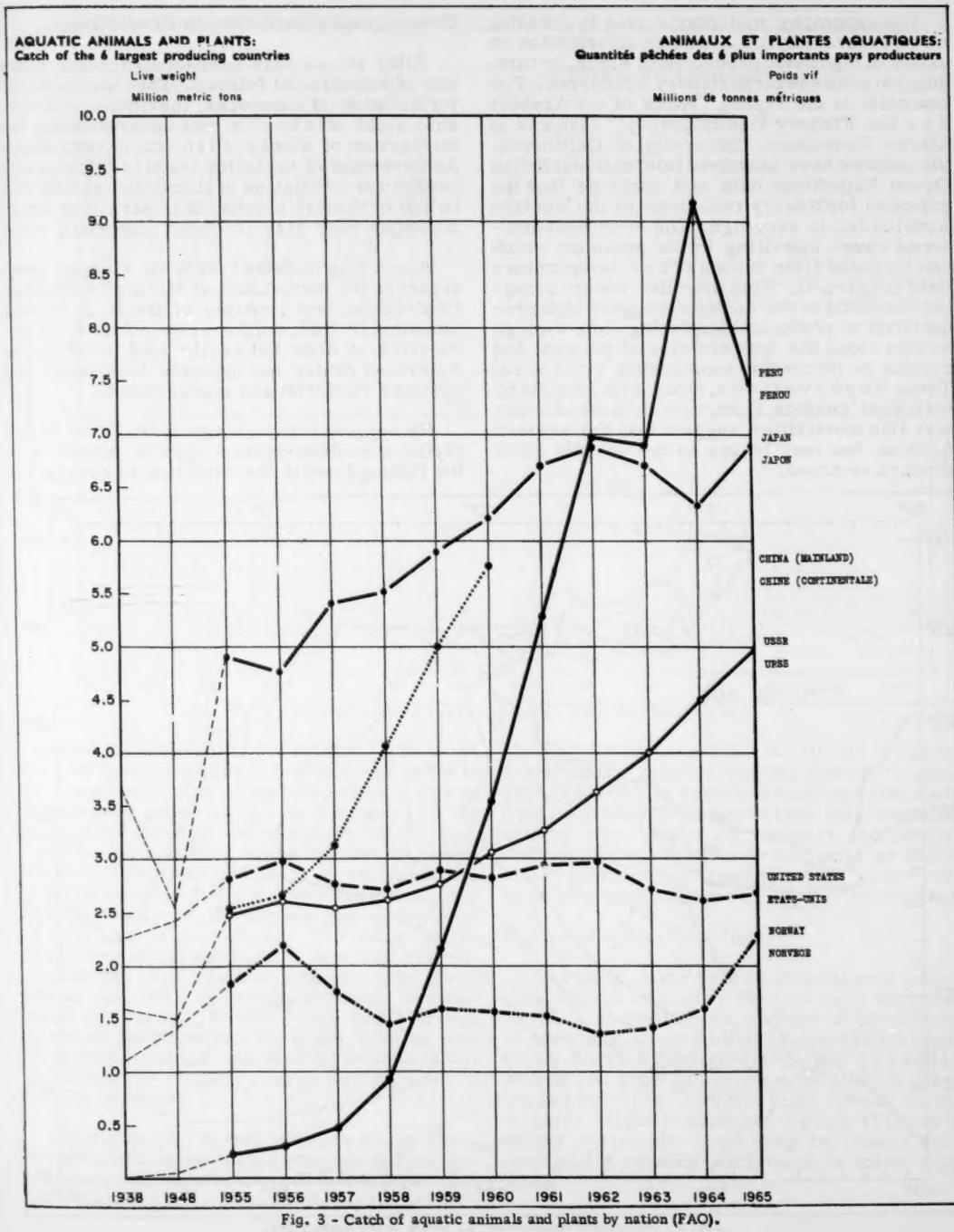


Fig. 3 - Catch of aquatic animals and plants by nation (FAO).

Oceanography will play a role in locating new resources by providing information on areas of high basic productivity which, in turn, suggest possible large fishery resources. For example, in the report, "Atlas of the Arabian Sea for Fishery Oceanography," Institute of Marine Resources, University of California, the authors have examined International Indian Ocean Expedition data and conclude that the potential for fishery resources in the western Arabian Sea is very high. The southwest monsoons cause upwelling in the summer, which can be noted from the surface temperature field (Figure 4). This upwelled water, bringing nutrients to the surface, triggers high productivity of phytoplankton during June through August along the western side of the sea, and results in increased zooplankton volumes. These observations, along with reports by merchant vessels from time to time of massive fish mortalities, suggest that the western Arabian Sea may be one of the world's most productive areas.

Oceanography Important to Prediction

After stocks have been located, some manner of assessment follows. This involves determination of substocks, maximum sustainable yield of stocks, and understanding the interaction of stocks with the environment. Achievement of the latter leads to information needed for prediction of abundance and distribution of the fish stocks. It is here that oceanography may play its most important role.

According to Sette (1966) in a paper presented at the Second Annual Marine Technology Conference, one problem of the U. S. fishing industry is that, unlike most other U. S. industries, it does not easily lend itself to the American genius for applying technology and systems research and management.

He suggests that a large obstruction to applying a modern-system type of operation at the fishing level is the variation in abundance,

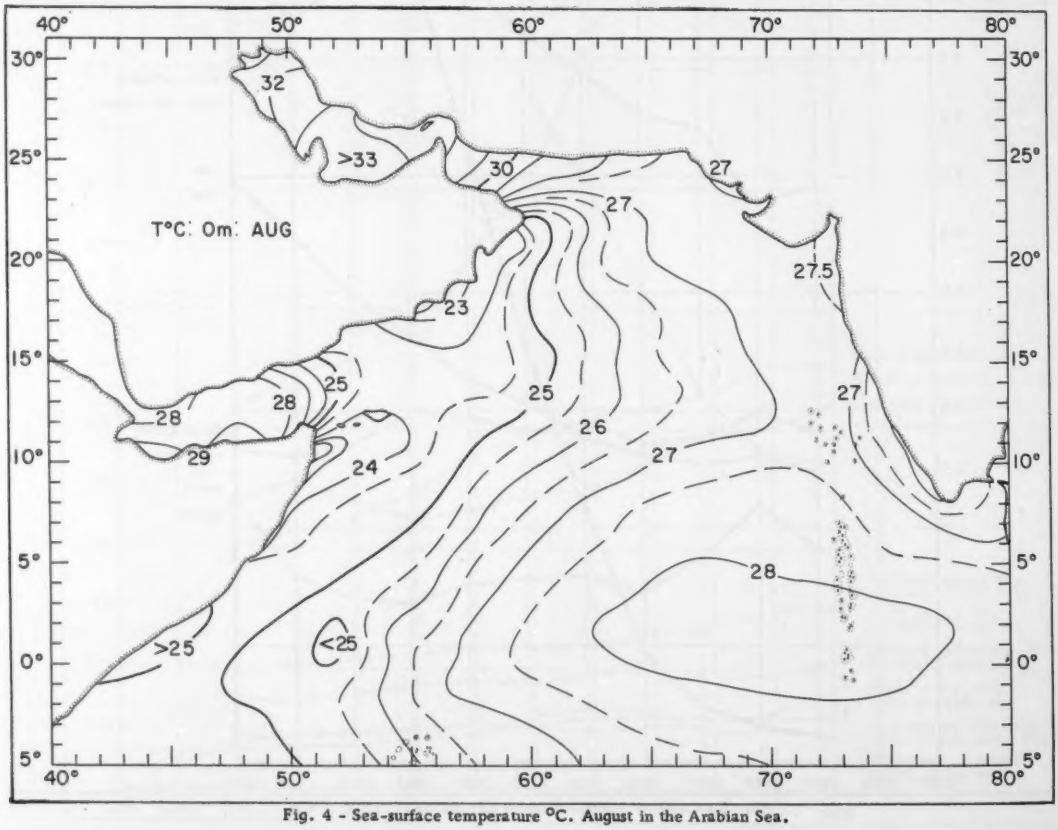


Fig. 4 - Sea-surface temperature °C. August in the Arabian Sea.

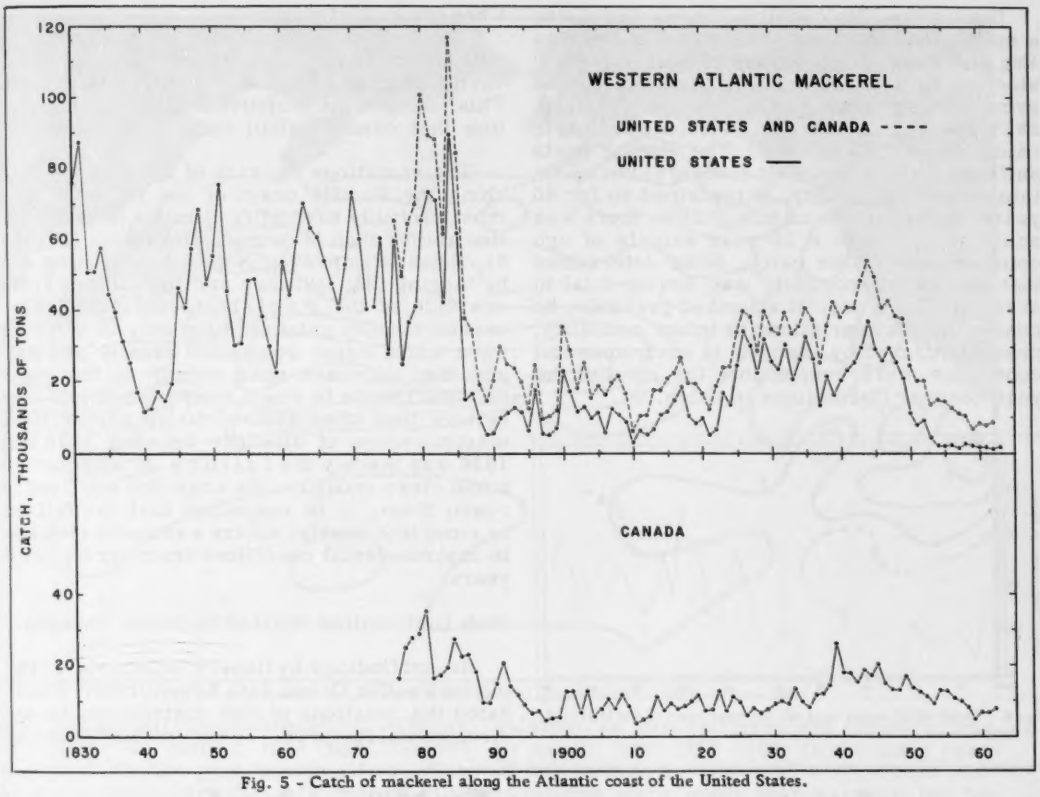


Fig. 5 - Catch of mackerel along the Atlantic coast of the United States.

location, and catchability of the fish. Too much time is spent hunting for fish; too little in catching them. On occasions, when a fleet comes upon good fishing, its landings glut the market and there is either a price reaction or, sometimes, a failure of the market to handle the fish. Often, the net effect on the fisherman is an income too little to keep his vessel and gear in repair; or, the income may be too little to keep him in the fishery. The effect on the processor or the wholesaler is a highly irregular supply of domestically caught fish. Since frozen fish have become a common international commodity, he can offset these irregularities by imports. No doubt this, as well as price advantage, has been a powerful factor in making this country a large net importer of fishery products.

Sette's thesis is that changes in the ocean environment cause major changes in fish distribution and abundance and thereby produce irregularities in fish catch. He points out substantial differences in the amplitude of fluctuations in the catch of various fishes. In general, the catch of bottom fishes like cod, haddock, and others fluctuates less than the catch of most other types. In contrast, the pelagic near-surface schooling fishes, such as tunas, mackerels, and herrings, fluctuate most widely in abundance and especially in distribution.

Factor of Infant Mortality

Variation in the overall abundance of a species may be caused by year-to-year variation in infant mortality. Regardless of the amount of spawning, it seems that in some years many young survive through larval and juvenile stages and grow to commercial size; in other years, very few survive. The record of the western Atlantic mackerel catch (Figure 5) shows variations which may be caused predominantly by such variations in infant survival.

During the 19th century, the mackerel was a major food item and a mainstay of the New England fishery. A barrel of salt mackerel stood along with the cracker barrel in almost every grocery and general store. Then, in 1885-1886, there was a catastrophic decline in catch of about 90 percent. The fishing ports suffered greatly, and salt mackerel became a minor food commodity. It remained so for 40 years. Then, in the middle 1920's, there was an upsurge. From a 10-year sample of age compositions in the catch, Sette determined that the infant mortality was nearly total in over half the years. It appeared probable, he concluded, that variations in infant mortality, probably caused by changes in environmental conditions, were responsible for most of the year-to-year fluctuations in catch.

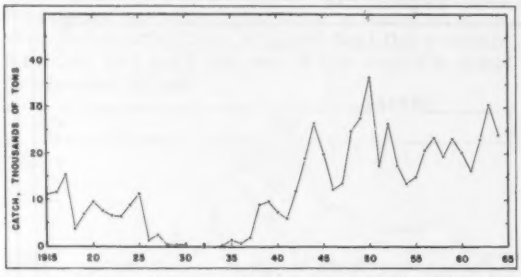


Fig. 6 - Catch of albacore tuna off the west coast of the United States.

Changes in Distribution

Another cause for fluctuation in catch is variation in distribution of fishable stocks. This changes the proportion of the fish population that comes within range of the fishery.

The variations in catch of albacore tuna along the Pacific coast of the United States most probably exemplify changes in distribution rather than in overall abundance (Figure 6). It has been proved by midocean fishing and by tagging that albacore are distributed from one side of the Pacific to the other. Our coastal fishery catches them only in summer when warm water conditions usually prevail, and they approach near enough to the coast for small boats to reach them. Scientists now believe that what seemed to be nearly total disappearance of albacore between 1926 and 1936 was merely the failure of albacore to come close enough to the coast for our fleet to reach them. It is suspected that the failure to move into coastal waters was due to changes in environmental conditions from previous years.

Fish Distribution Related to Ocean Changes

Recent findings by fishery scientists working on Pacific Ocean data have further elucidated the relations of fish distribution to environmental features. To understand these re-

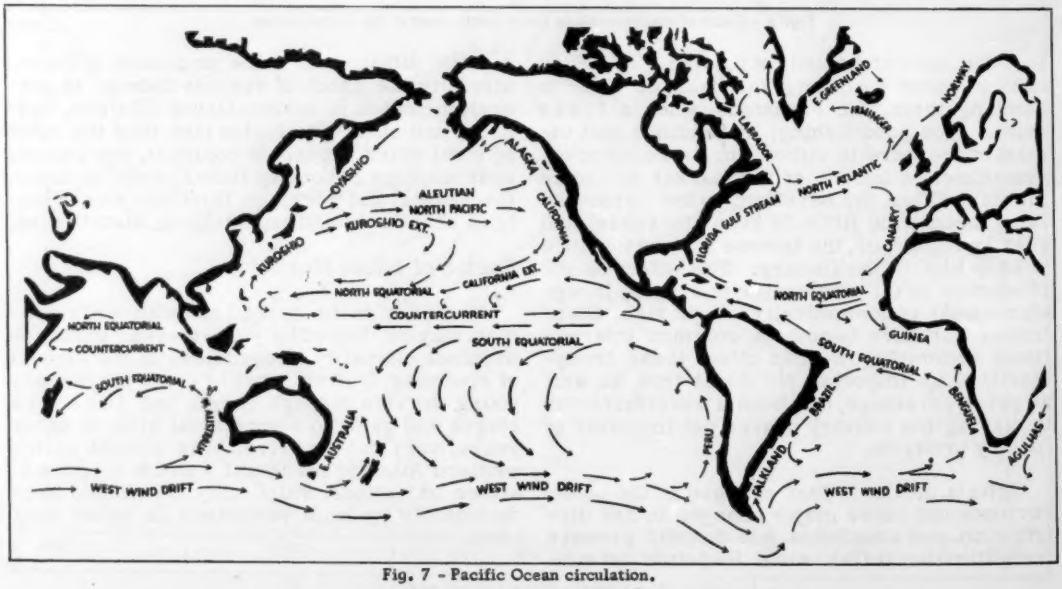


Fig. 7 - Pacific Ocean circulation.

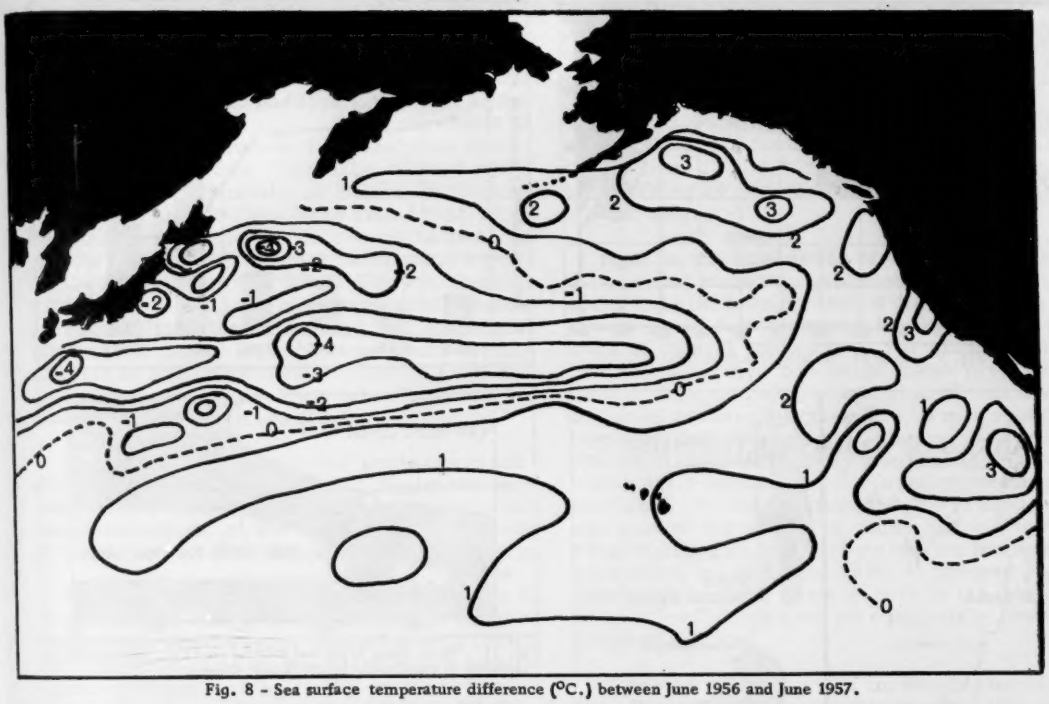


Fig. 8 - Sea surface temperature difference (°C.) between June 1956 and June 1957.

lations, it is helpful to know something of North Pacific Ocean circulation. It is characterized by a large clockwise gyre, essentially similar to the atmospheric circulation (Figure 7). The North Pacific drift flowing easterly splits off the Oregon-Washington coast into a northward flowing current forming the Alaska gyre, and a south-eastward flowing cold California Current which turns westward off Baja California. The latter current flows past Hawaii as California Current Extension waters, becomes part of the North Equatorial Current, passes northward as the warm Kuroshio Current, and mixes with the cold southward flowing Oyashio to complete the clockwise pattern.

These currents and water masses can be identified by their temperature and salinity characteristics. For instance, the California Current, since it originates in northern latitudes, is a cold current. High rainfall and reduced evaporation in north latitudes also tend to keep its surface salinity relatively low.

The Bureau of Commercial Fisheries laboratory at Stanford University has been studying broad-scale changes in Pacific Ocean circulation, as inferred from sea temperatures, by month, from 1949-1962. In the early years of this period, the eastern Pacific Ocean temperatures were lower than average, but between 1956 and 1957 the eastern Pacific became much warmer and the western Pacific colder and remained so for several years (Figure 8).

The distribution of albacore in the North Pacific is seemingly affected by these broad-scale changes in the ocean climate. At some stage of their life history, the North Pacific albacore are sought by Japanese live-bait fishermen off Japan, Japanese longline fishermen in the west central North Pacific, and sport and commercial fishermen off the west coast of North America (Figure 9).

In May and June each year, the albacore move from central North Pacific into North American coastal waters. When spring warming occurs early in coastal waters, there is some evidence, though not conclusive, that albacore are available earlier to fishermen. If the coastal waters are warmer than usual, the fish appear farther north. The area of best

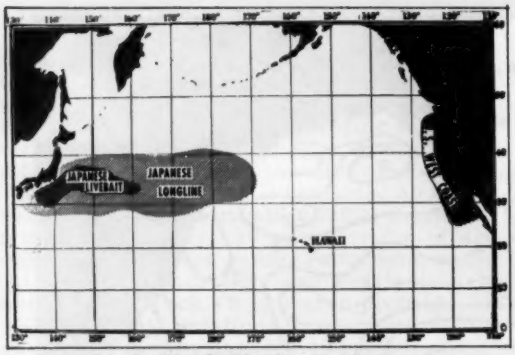


Fig. 9 - North Pacific albacore fisheries.

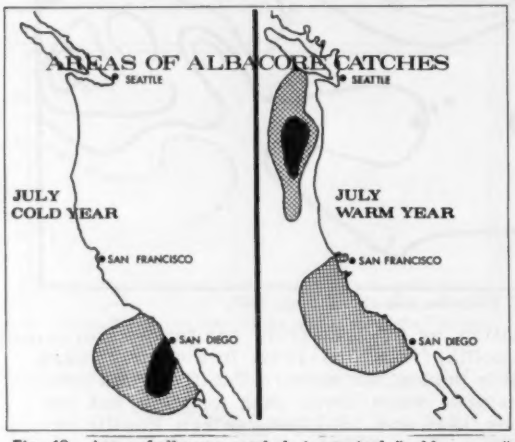


Fig. 10 - Areas of albacore catch during typical "cold ocean" years and "warm ocean" years.

catches during typical warm years is off California, Oregon, and Washington. In cold years, most of the fish remain to the south--off Baja California and California (Figure 10).

The temperature changes reflect changes in the California Current System. When large-scale changes occur, they usually persist for several months and sometimes for several years. This persistence over an extended period provides the basis for forecasting. In some years, however, preseason forecasts have been made but subsequently proved incorrect because of radical changes in ocean conditions between time of forecast and onset of fishing. The year 1967 is a case in point: The ocean temperature in the eastern Pacific changed radically from a cold temperature anomaly to a warm anomaly in a matter of a

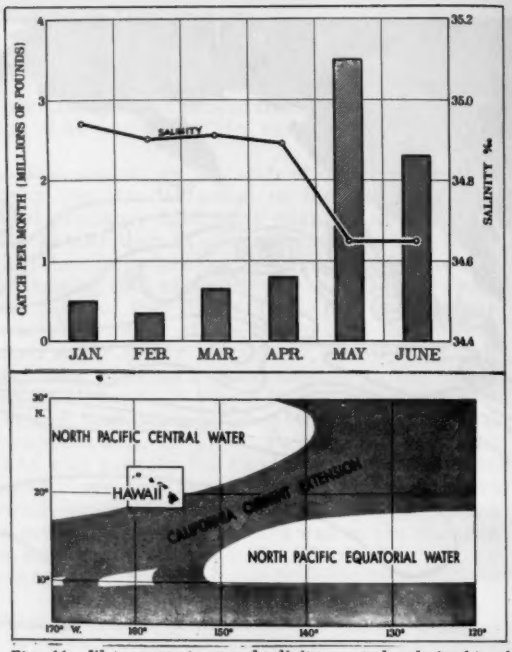


Fig. 11 - Water mass types and salinity--catch relationship of skipjack in the Central North Pacific Ocean.

few weeks--and threw the initial forecast off. Fortunately, scientists were able to detect these changes early and adjust the forecast as the season progressed. Evidence suggests that unusual atmospheric circulation in summer 1967 caused an abnormal amount of heat flux into the surface layers of the ocean in the northeastern Pacific. This in turn caused seasonal warming of surface waters to proceed at an unusually high rate. Precision in forecasting will not improve until understanding of ocean and air-sea interaction processes causing these changes is further developed.

Downstream from the California Current, variations in the California Current Extension waters affect the Hawaiian skipjack fishery. Important to Hawaii are the North Pacific Central and North Pacific Equatorial water types and the transition zone between these, the California Current Extension (Figure 11). The boundary between the California Current Extension, with relatively low salinity, and the North Pacific Central water, with relatively high salinity, is well defined by a salinity gradient which usually lies just south of the islands during late autumn and early winter.

Normally, during February or March, the salinity gradient, and thus California Current Extension water, begins a northward movement. It passes the islands in spring and reaches its northern position just north of the islands in July or August. The movement of the boundary is monitored by analyses of salinity samples taken regularly at near Koko Head, Oahu. Scientists at BCF's Biological Laboratory in Honolulu have found that when the California Current Extension bathes the islands in summer, skipjack landings are generally high, but when North Pacific Central water prevails, landings are usually below average. From these findings, and additional information on the time that seasonal warming of surface waters occurs, predictions are being made on whether skipjack landings will be above or below average for the season.

At the western extreme of the large clockwise gyre of the North Pacific, Japanese scientists have also determined relationships between variations of the Kuroshio and success of the albacore and skipjack fisheries there.

Mentioned earlier was the eastward flow of North Pacific water diverging off the coast of Washington and Oregon. A part of this forms the counter-clockwise Alaska gyre and the Alaska stream flowing to the westward south of the Aleutians. Scientists at BCF's Biological Laboratory, Seattle, now believe that reduced flow of the Alaska stream in the spring of 1966 affected the migration routes of maturing Bristol Bay sockeye salmon, and thus affected the number of salmon available to the high-seas fishery.

Clearly, one can conclude from these few examples that variations in the ocean climate have major effects on the abundance and availability of fishery resources. An essential step toward increasing productivity of United States fisheries would be to proceed with oceanographic programs that would increase understanding of the processes causing changes in the "ocean climate." This would lead to more effective fishery predictions.

New Harvesting Techniques Needed

Development of new harvesting techniques is urgently needed in some segments of the fishing industry. In the broadest definition, these techniques can be classified as ocean engineering developments. Two examples show how development of new harvesting techniques greatly increased fleet efficiency.

The first example is development of the power block and nylon purse seine in the Pacific tuna fishery. Following World War II, the California tuna fleet experienced several very profitable years through live-bait fishing. By the early 1950's, however, a major change occurred: imports from the Japanese tuna fishery hit heavily and, for a time, it appeared that tuna fishing by the domestic fleet might disappear entirely.

In 1956, the first seeds of technological advances that were to revolutionize the fishery occurred with development of the nylon net and power block for improved hauling of seines. Lack of capital and natural reluctance on the part of fishermen to change their method of fishing delayed rapid conversion of bait boats to purse seiners. It soon became evident, however, that large purse seiners could operate much more efficiently than bait boats. Accordingly, even though the cost of converting to purse seiners ranged from $50,000 to $150,000, and cost of the all-nylon purse seine was approximately $50,000, conversion increased gradually; in 1959 and 1960, it jumped to an unbelievable rate. Few events in the history of a major fishery have so completely revolutionized a fleet.

The second example of increasing harvesting efficiency is the development of the midwater trawl and telemetering device in the Pacific hake fishery. Hake resources are known to be abundant off Oregon and Washington, and the Soviets have been fishing them heavily. However, it was not until BCF ocean engineers developed a midwater trawl capable of fishing hake off the bottom did the United States reach the point where harvest could be attained efficiently with small vessels. The ability to position the trawl at certain depths was the clue to efficient harvesting. This was possible only through development of a depth telemetering device to accurately position the net. This is evidence that innovations do not have to be of major proportions to have a great impact on increasing harvesting effectiveness.

Summary

In summary, then, it is clear that the role of oceanography in the development of food resources will be large. Through oceanographic investigations to determine areas of high basic productivity, new resources will be located; oceanographic studies to determine the relation of fish stocks to the environment will lead to predictions of abundance and availability;

and ocean engineers will develop new harvesting techniques that will put the U. S. fleets again in a competitive position with foreign fleets. The development of new processing techniques and products, such as fish protein concentrate (FPC), and marketing programs also will play major roles in the growth of world and domestic fisheries.

LITERATURE CITED

SETTE, O. E.
1966. Ocean Environment and Fish Distribution and Abundance, Exploiting the Ocean, Transactions of the 2nd Annual MTS Conference and Exhibit, pp. 309-318.

SCHAEFER, M. B.
1965. The Potential Harvest of the Sea. Transactions of the American Fisheries Society, vol. 94, No. 2, pp. 123-128.

(Robert K. Brigham)

IMPROVING AND EXPANDING THE DISTRIBUTION OF FRESH (UNFROZEN) SEAFOODS BY MEANS OF INSULATED CONTAINERS [1/]

By Staff of the BCF Technological Laboratory, Gloucester, Massachusetts

The rigidly limited distribution of fresh (unfrozen) fish fillets has traditionally meant that inland consumers seldom have enjoyed fresh seafood products in their homes. To remedy this situation, the Bureau of Commercial Fisheries has developed an insulated, leakproof, non-returnable container suitable for extended shipments of seafood products in non-refrigerated air, rail, or truck freight. With certain accessories, this container may well make possible the transcontinental shipment of unfrozen seafoods by refrigerated (0° F.) trucks. Shipments on such refrigerated trucks to consuming areas well beyond present markets have already been made.

The discriminating U. S. consumer wants fresh (unfrozen) fish of high quality. How else explain the crowded seafood restaurants of our coastal cities and towns? Relatively few of our inland consumers, however, enjoy in their homes the delicate flavors and succulent textures of ocean-fresh, unfrozen seafoods.

There are many reasons that this demand goes unsatisfied. The major reason is the unavailability of an adequate distribution system, or of a wholly satisfactory means of utilizing the system. The fresh fish industry has never, for example, been able to fit its products into the efficient, modern, and flexible frozen-food distribution system, nor, for that matter, fully into the air-freight system. In an attempt to correct this situation, the Bureau of Commercial Fisheries Technological Laboratory at Gloucester, Massachusetts, has devised a versatile shipping container adaptable to the air, rail, or truck systems--either non-refrigerated or refrigerated to temperatures as low as 0° F.

The ideal container would be one which, while protecting the quality and appearance of fresh seafoods, would be capable of maintaining a fixed internal temperature, be entirely independent of external temperatures, be leakproof, be easily handled, be adaptable to small-order marketing and, most important, be inexpensive. It would be useful in rail, truck, and air shipments and be reasonably independent of any limitations as to time and distance in storage and transit. Since no small, inexpensive container can, as yet, maintain a fixed internal temperature nor be wholly independent of external temperatures, since many trucks have uncertain schedules, and distributors, at present, require ice on their delivered seafoods, no ideal container yet exists.

The Bureau-developed container is, in effect, a single basic container which, through use of available accessories, can be adapted to many different distribution conditions. It is insulated, leakproof, and with appropriate adjustments is suited for use in rail, truck, and air shipments. With small quantities of ice, it can be used in non-refrigerated 900-mile rail or truck shipments or on non-refrigerated, transcontinental air-freight, assuming normal transit times. Reefer-truck shipments, with van temperatures of 0° F., from Boston to Chicago and to Dallas have been made with satisfactory results. Experimental shipments, using special insulation and inexpensive "heat-source" devices in 0° F. vans from Gloucester to Los Angeles are in progress.

General Characteristics of the Basic Container

A corrugated, non-returnable box (specifications given in Figure 1) holds the structure together. A polyethylene bag, used as a liner, catches and holds any liquid which may drain

1/ This is a general report on recent developments in shipping containers for fresh fish. Detailed reports on individual phases of the research will be published later. This is published in view of an expression of urgency by industry.

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	NOMINAL SIZE	100-LB. BOX	$	75-LB. BOX	$		$
	CORRUGATED FIBREBOARD BOX, WHITE, PRINTED ON 4 SIDES	19-1/4" x 16-1/4" x 12-1/4" 275 PSI SINGLEWALL	.82	18-1/2" x 16" x 17-1/2" 200 PSI SINGLEWALL	.44		
	POLYETHYLENE BAG 0.003 GAUGE	38" x 54"	.18	38" x 50"	.15		
	FOAMED POLYSTYRENE @ $0.065 PER BOARD FT.	1-1/2" x 16-1/4" x 19-1/4" (6 PIECES)	1.27	1-1/4" x 16" x 18-1/2" (2 PIECES) 1-1/4" x 16" x 15" (4 PIECES)	.86		
	TOTAL MATERIAL COST (OPTIONS NOT INCL.)		2.26		1.47		
OPTIONS	ABSORBENT FOAM (UREA FORMALDEHYDE)	$0.29 PER BOARD FT. 1 PIECE 19" x 16" x 3"	1.25	$0.29 PER BOARD FT. 1 PIECE 19" x 16" x 3"	1.25	FOR TRANSCONTINENTAL SHIPPING, ADDITIONAL FOAM IS RECOMMENDED	0.60
OPTIONS	DOUBLE STRAPPING		.10		.09		

Note: Cost data are based on 1,000 quantity delivered to New England (tentative).

Fig. 1 - General characteristics and costs of corrugated, non-returnable shipping container.

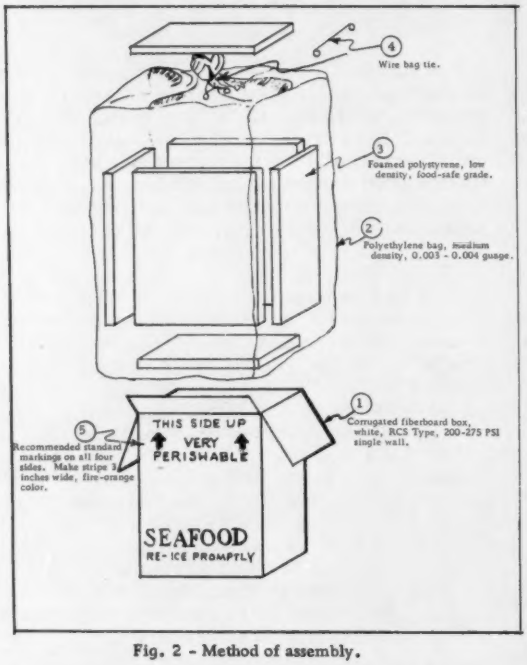


Fig. 2 - Method of assembly.

from the ice or the seafood. Slabs of foamed, food-safe plastic (density, thickness, and type to be determined by expected use) are placed on all six sides of the container to insulate the food product from its surroundings. Strapping may be used to give additional strength and dimensional stability to the package if deemed necessary. If it is anticipated that the container will be exposed to highly humid conditions, the corrugated outer shell should be wax-impregnated. The method of assembling the container is shown in Figure 2.

Non-Refrigerated Air, Rail, or Truck Transport

For this type of shipment, the basic container is used. Low-density, food-grade polystyrene slabs ($1\frac{1}{4}$ inches in thickness) are used as insulating agents. The product being shipped is either pre-chilled and iced, or a quantity of ice sufficient to both chill and maintain a low product temperature is placed in the container. (See Figure 3 for chilling and icing guidelines.)

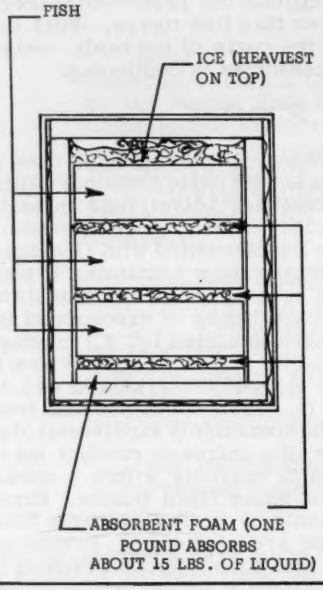
Melt-water from the ice may, if desired, be absorbed into a foamed urea-formaldehyde pad placed on the bottom of the container. One board-foot of the foamed plastic, costing about 29 cents, will absorb about five (5) pounds of melt-water. Distribution time is the limiting factor in the use of this container since the product temperature cannot be lowered below that of melting ice (32° F.). It appears to be ideally suited for transcontinental air-freight shipments and for non-refrigerated truck or rail shipments to current markets.

Refrigerated Truck Transport

For extended transcontinental reefer-truck shipments, a variety of accessories to the basic BCF container is available. Thus the type of insulation may be varied, from the reasonably effective expanded polystyrene to the extremely effective polyurethane. Secondly, the thickness of the insulation may be increased. Thirdly, a temperature-regulating (heat-source) device may be included in the container.

The temperature-regulating accessory utilizes the fact that freezing can be a heating process. For every pound of water frozen, 144 (BTU's) of energy must be withdrawn in the form of heat. This heat is absorbed by the immediate surroundings, be they the plates of a shelf-freezer, other food products, or the surrounding air. The net effect, if the energy dissipation is limited, is a localized heating inhibition or cooling.

Pure water, under normal atmospheric conditions, freezes at 32° F. The water in fish tissue, since it contains dissolved salts such as sodium chloride, freezes at a lower temperature--between 29.8° and 30.3° F. Therefore, in an insulated container, a quantity of water will freeze completely before the water content of accompanying fish flesh begins to freeze; and, the heat slowly withdrawn from the water during freezing will serve to regulate the internal temperature of the container at 32° F. for a considerable period of time.



ICING GUIDELINES (BASED ON 1-1/4 INCHES OF FOAMED POLYSTYRENE INSULATION)

There must be sufficient ice to cool the fish to 32° F. and keep it at that temperature until it reaches its destination. To cool the fish to 32. F. from:

40° F., add 5 lbs. of ice per 100 lbs. of fish
50° F., add 10 lbs. of ice per 100 lbs. of fish
60° F., add 16 lbs. of ice per 100 lbs. of fish
70° F., add 21 lbs. of ice per 100 lbs. of fish

To keep the fish cool when the ambient temperature is:

40° F., add 2 lbs. of ice per 24 hrs.
60° F., add 6 lbs. of ice per 24 hrs.
80° F., add 10 lbs. of ice per 24 hrs.
100° F., add 14 lbs. of ice per 24 hrs.

Example: How much ice is needed for a 50-lb. box of fish when the initial product temperature is 60° F., the estimated time in transit is 1-1/2 days, and the average ambient temperature in transit is estimated at 80° F.?

To cool: $\frac{16}{100}$ X 50 = 8 lbs.

To keep cool: 10 X 1-1/2 = 15 lbs.

Total ice required = 8 + 15 = 23 lbs. minimum

Fig. 3 - Icing guidelines.

One such heat-regulating accessory is a water-soaked, foamed urea-formaldehyde plastic. It acts like a sponge, absorbing a quantity of water 15 times its own weight. The placement of six thin (one-inch) slabs of water-soaked formed plastic next to the polystyrene insulation ensures maximum absorption within the container of the heat energy released by the water upon freezing. (See Figure 4 for comparison of product temperatures in two insulated containers, one of which is equipped with such a temperature-regulating device.) Note that while the seafoods in the control (no-foam) container went into the zero-degree (0° F.) room at a higher temperature than that in the foam-containing container, there was a "cross-over" in product temperature after 36 hours of simulated transit storage. In addition, the temperature of the control container continued to drop until the product therein began to freeze at 29° F. In contrast, the temperatures of the seafoods in the experimental (foam) container held constant at 31° F. for an additional period of 56 hours, at which time the test was terminated.

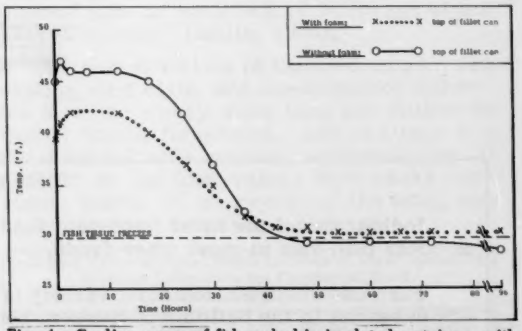


Fig. 4 - Cooling curves of fish packed in insulated containers, with and without water-absorbent foam, and stored at an ambient temperature of 0° F.

Such "crust-freezing" of the seafood, as occurred in the control container, could be damaging to the fish tissue even if maintained for only a relatively short time, and even if the temperature of the product, upon arrival, is brought rapidly up to 32° F. The appearance and the moisture-holding capacities of the

fillets are adversely affected. Moreover, maintenance by the receiver of special facilities for elevating the temperature of the "crust-frozen" product prior to final distribution and retail sale would be necessary.

Counting the Costs

A summary of the costs of this type of packaging is given in Figure 1. Without the options, the per-pound cost is seen to be 2.05 cents for the 100-pound size, and 1.96 cents for the 75-pound size. This is about double the per-pound cost of the commonly used nailed wood boxes. The new container, however, is acceptable on any carrier whether ice is used or not, and as more carriers refuse to accept leaky packages, this factor becomes of increasing importance. Also important is the fact that if ice is used in the new container, the marketing area for fresh fish can be extended to an 1,800-mile radius; and our preliminary tests indicate that although using the absorbent foam will increase the package costs to about $3\frac{1}{2}$ cents per pound, marketing areas over 3,000 miles distant can be reached via ordinary refrigerated trucks at a cost of approximately one-sixth that of air freight.

While the urea-formaldehyde absorbent foam is relatively expensive, it can be reused many times. It is, therefore, possible to reduce its cost per-pound of fish fillet by arranging for its return to the shipper. An inexpensive, closed, tinned container shaped like a cake tin and filled with water may be used in place of the plastic. It is only necessary that the container, regardless of composition, be such as to facilitate the preferential freezing of water rather than fish tissue. Work to reduce further the costs of the basic container and of its accessories is continuing.

SUMMARY

All work reported on herein was done with haddock fillets and the basic container utilizing low-density expanded polystyrene insulation. For the extended reefer-truck shipments, the container was supplemented with 11 ounces of urea-formaldehyde foam containing 13 pounds of water. The experimental data indicate that, under adverse conditions of exposure of individual containers to cooled (0^{o} F.) moving (to 200 ft. per minute) air, fresh unfrozen fish fillets may be shipped to markets in an 1,800-mile radius of Boston, assuming normal transit times. When the container is supplemented with a heat-source, the unfrozen product may be safely shipped to markets within a minimal radius of 2,650 miles from Boston. Experimental shipments by reefer van from Boston to Los Angeles are continuing. Preliminary data indicate that such seafood reaching Los Angeles after 5 days in transit will still enjoy a high quality shelf-life of up to 8 days.

FISH FACTS

Iodine, one of the most important food elements, is found in a higher percentage in ocean fish than in most other foods.

Fish and shellfish contain a variety of health-giving minerals. These minerals are essential in the building of tissues, bones and teeth.

The high nutritive quality and digestability of fish proteins class seafood among the more desirable food products.

Fish within the many marketed varieties gives you a choice of a great diversity of taste treats, and remember, fish fats are those healthful polyunsaturated fats.

Fish supplies nutritionally complete protein for proper body growth and repair, and always many essential vitamins and minerals for your complete body health and vigor.

SUBMARINE PHOTOS OF COMMERCIAL SHELLFISH OFF NORTHEASTERN UNITED STATES

By Roland L. Wigley* and K. O. Emery**

Several thousand photographs of the sea bottom off the northeastern coast of the United States were taken as part of a joint study by the Woods Hole Oceanographic Institution, the U. S. Bureau of Commercial Fisheries, and the U. S. Geological Survey. Nearly every photograph reveals the presence of animals living in or on the bottom. Of special interest are the commercially valuable mollusks--the sea scallop (Placopecten magellanicus Gmelin), surf clam (Spisula solidissima Dillwyn), and ocean quahog (Arctica islandica Linnaeus).

Occurrence records from the photographs correspond closely with the distribution patterns for each species based on other sources. Living sea scallops were clearly apparent in the bottom photographs; of surf clams and ocean quahogs (usually buried with only the siphons exposed) only the shells of dead specimens were detected. All three species are restricted to the continental shelf, and their geographic distributions overlap considerably.

The photographs may provide clues to more efficient methods of harvesting these species.

The photographs were made at more than 300 locations between Cape Hatteras, North Carolina, and the Gulf of Maine in water depths from 2 to 1,810 fathoms (fig. 1). Single photographs were taken at 289 localities (indicated by open circles in fig. 1) mostly with a camera incorporated within a large clam-shell bottom sampler as part of a program of systematic sampling of the Atlantic continental margin (Emery, Merrill, and Trumbull, 1965). Twenty-six other sites (indicated by solid dots in fig. 1) are photographic stations where as many as 3,000 closely spaced photographs were made. These sites include: (1) remote-controlled multi-photograph camera stations in 10 submarine canyons, and one place on the open continental slope; (2) a stereographic camera system mounted on the hull of the research submarine "Alvin" (Schlee, 1967) during dives in two submarine canyons, and at two sites on the open continental slope and three on the continental shelf; (3) multi-photograph camera (two types) mounted on sleds drawn along the sea floor by research ships; (4) photographs taken with a pogo-type multi-photograph camera (Posgay, 1958); and (5) mosaic mapping of part of the continental rise in search of wreckage of the USS "Thresher" (Iselin, 1964).

The annual value of the combined sea scallop, surf clam, and ocean quahog fisheries is currently more than $16 million to United States fishermen. Sea scallops are the most valuable species, accounting for 80 percent of the total value. Surf clams constitute nearly 20 percent of the total, and ocean quahogs less than 1 percent.

Ex-Vessel Value of United States Landings of Three Species of Shellfish Taken from the Continental Shelf off Northeastern United States

Species	1945[1]	1955[2]	1965[3]
Sea scallop	1,887,215	11,449,000	13,126,307
Surf clam	629,591	1,365,000	3,197,140
Ocean quahog	109,387	47,000	11,000

1/Anderson and Power, 1949.
2/Anderson and Power, 1957.
3/Lyles, 1965.

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Note: Contribution No. 2079 from the Woods Hole Oceanographic Institution.

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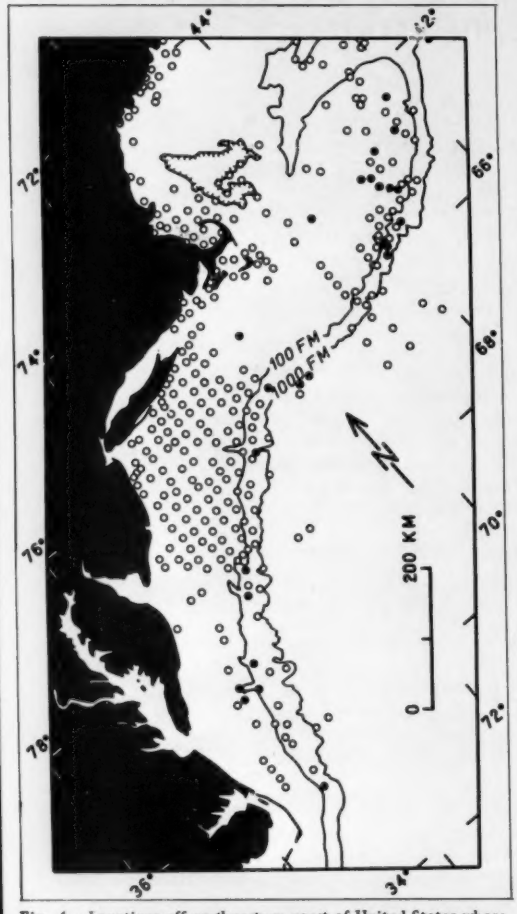


Fig. 1 - Locations off northeastern coast of United States where photographs of sea bottom were made. Open circles denote sites of single photographs; solid dots denote multi-photograph stations.

The quantity and value of sea scallop and surf clam landings have increased markedly since World War II. The value of both species has increased five-fold during a 20-year period. Ocean quahog landings, on the other hand, diminished in quantity and total value because of reduced consumer demand.

GEOGRAPHIC DISTRIBUTION

The geographic distributions of sea scallops, surf clams, and ocean quahogs along the northeastern coast of the United States are illustrated in figures 2, 3, and 4, respectively. These charts are based on literature reports, fishery data, and experimental dredgings. All sources agree in showing that these shellfish are restricted to the continental shelf, and that their areal distributions have considerable overlap. Sea scallops have been exploited throughout most of their known distribution area, but surf clams and ocean quahogs are fished only locally.

Included on each distribution chart are station marks that indicate the locations where the specimens, either living or dead, were detected in photographs of the sea bottom. The charts reveal that, with few exceptions, the records of occurrence from sea-bottom photographs fall within distributions derived from catch records and other sources.

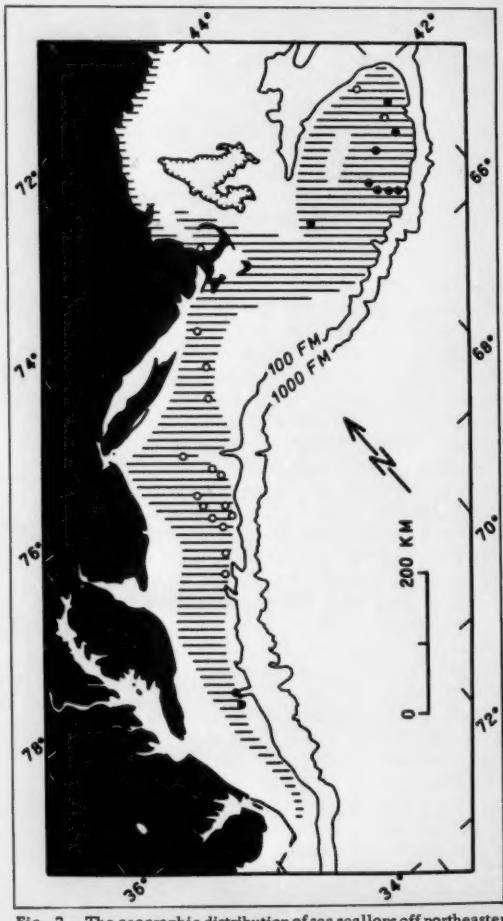


Fig. 2 - The geographic distribution of sea scallops off northeastern coast of United States. Crosshatching marks area where sea scallops have been collected. Circles and dots show locations where sea-floor photographs revealed live sea scallops or their shells.

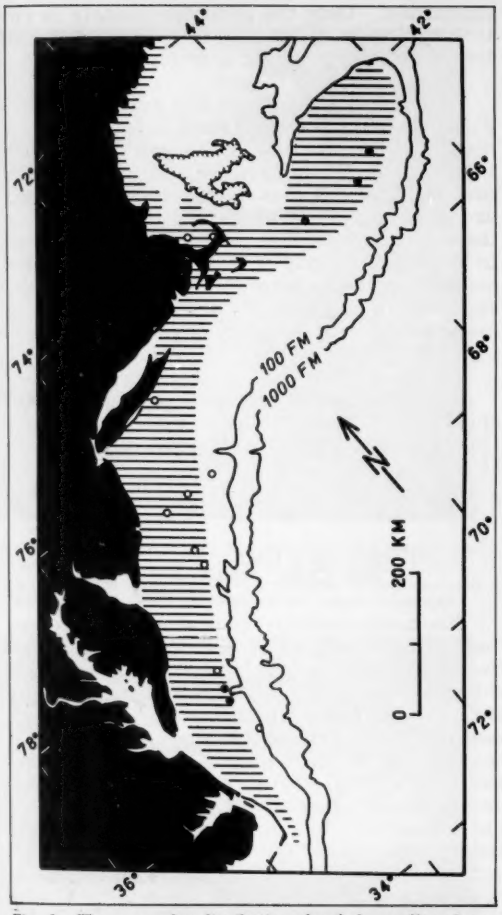


Fig. 3 - The geographic distribution of surf clams off northeastern coast of United States. Crosshatching marks area where sea clams have been collected. Circles and dots show locations where sea-floor photographs revealed surf clam shells.

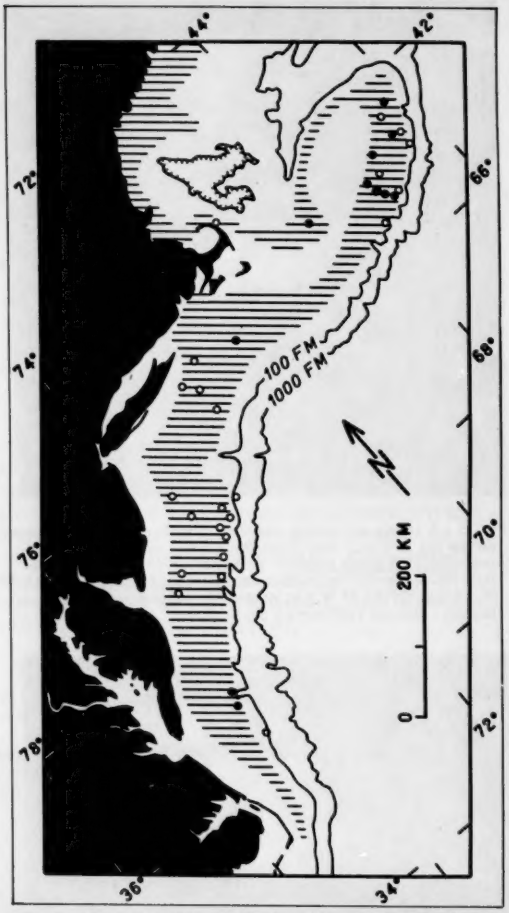


Fig. 4 - The geographic distribution of ocean quahogs off northeastern coast of United States. Crosshatching marks area where ocean quahogs have been collected. Circles and dots show locations where sea-floor photographs revealed ocean quahog shells.

SEA SCALLOP

Atlantic Deep-Sea Scallop
Deep-Sea Scallop, Giant Scallop

The sea scallop, Placopecten magellanicus Gmelin, occurs along the North American coast from the Gulf of St. Lawrence to Cape Hatteras, N. C., and is taken commercially by both United States and Canadian fishermen. This fishery became important just after World War II when increased demand resulted in substantially higher prices. The principal sea scallop stocks that were fished during this rapid expansion of the fishery were on Georges Bank, but recently a substantial part of the effort has shifted to grounds between New York and northern Virginia. The bulk of the American catch is landed at New Bedford, Mass.

Sea scallops are customarily caught with heavy steel dredges 10 to 15 feet wide operated from vessels 40 to 100 feet long. Two dredges are towed simultaneously, each attached by a separate towing warp. The

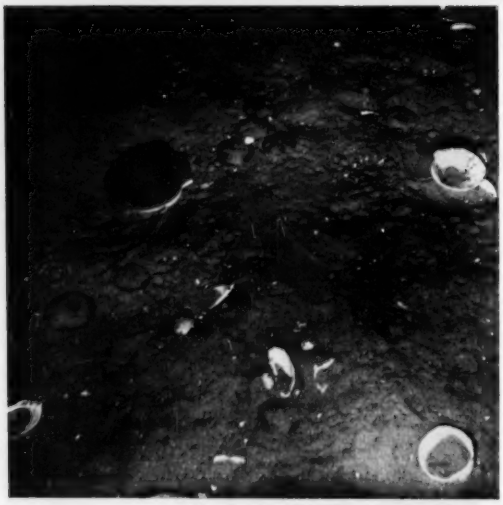


Fig. 5 - A living sea scallop and shell remains of ocean quahogs on the sea bottom. The round flat objects are live sand-dollars, Echinarachnius parma. This photograph was taken from R/V "Albatross IV" on southeastern Georges Bank (Lat. 41°13.5' N., Long. 66°38.5' W.) at station 45; water depth 45 fathoms; bottom sediment light-brown coarse sand.

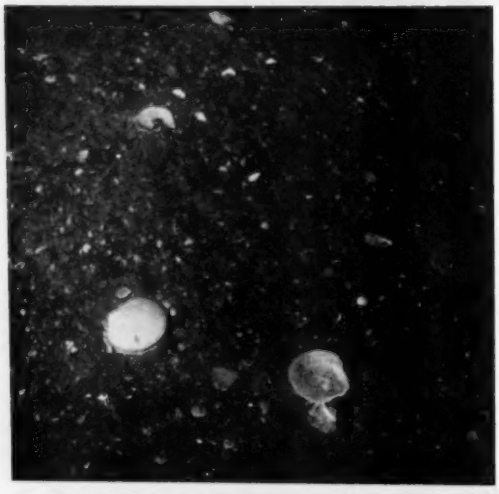


Fig. 6 - Live sea scallops and shells on the sea bottom on western Georges Bank (Lat. 41°09.1' N., Long. 68°43.2' W.); photo taken by research submarine "Alvin" during dive 215; water depth 33 fathoms; bottom sediment brown pebbles.

dredges are hauled every ½ to 1 hour, depending upon local abundance, and the contents are dumped on deck. The scallops are shucked at sea and the viscera and shells are discarded. Only the adductor muscle is retained; the muscles are bagged in 36-pound lots, iced, and brought to port.

Market-size scallops are generally 3½ to 6 inches in diameter (shell height). Specimens of this size live on the sea bottom, unattached, and free to move about when disturbed. They are clearly exposed to view and are thus readily detected in photographs of the sea bottom. The photographs show that in relatively soft sandy bottoms they inhabit pockets or depressions (fig. 5). Where the sediment is compact, or composed of coarse materials, the pockets are small and shallow (fig. 6).

For additional information concerning this species and the fishery, refer to Posgay, 1953; Bourne, 1964; and Merrill and Posgay, 1964.

SURF CLAM

Atlantic Surf Clam, Sea Clam, Bar Clam, Hen Clam

The commercially important surf clam that inhabits the northeastern coast of the United States is Spisula solidissima Dillwyn, a large (up to 7½ or 8 inches long) heavy-shelled bivalve most commonly found in sandy sediments. A demand for this species developed during World War II as a substitute for soft clams (Mya) and this has since developed into a major fishery. It started in the New York area, but it is centered now in the New Jersey-Maryland region; most of the catch is landed at Cape May and Point Pleasant, N. J.

The chief means of taking surf clams is with a hydraulic dredge. These dredges are 3 to 4 feet wide with a water jet system across the front, 8 to 12 feet long, and a cod end made of steel rings. Bottom materials and clams in the path of the dredge are loosened by jets of water pumped from the fishing vessel as the dredge is towed slowly along the bottom. Whole clams are bagged in bushel-size lots and brought to canneries ashore for processing.

Surf clams burrow into the sediment and position themselves with their posterior end upward so that the siphons are in contact with the overlying water. Thus only the siphons tips are exposed and visible. No living surf clam shells were evident in the sea-bottom

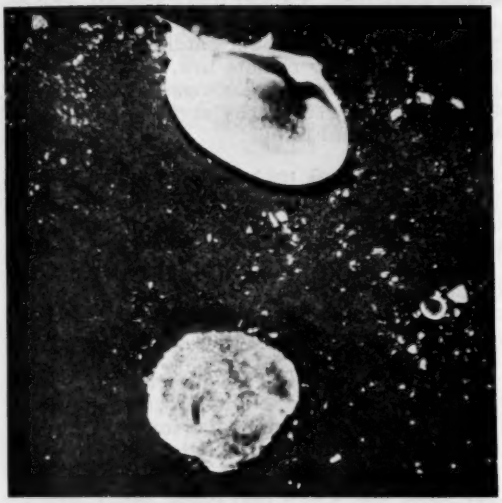


Fig. 7 - Surf clam shell (top) and eroded sea scallop shell on the sea bottom off New Jersey (Lat. 39°31.2' N., Long. 73°15.8' W.); photo taken by R/V "Gosnold" at station 1375; water depth 21 fathoms; bottom sediment medium and coarse brown sand.

Fig. 8 - Surf clam shell on sea bottom with other shell fragments and sand-dollar tests; taken by R/V "Gosnold" off New Jersey (Lat. 38°52.4' N., Long. 73°45' W.) at station 1353; water depth 24 fathoms; bottom sediment brown medium sand.

photographs; only the shells of dead specimens were detected (figs. 7 and 8).

We could not definitely distinguish in all photographs the shells of S. solidissima from a rather rare species that has a similar appearance: Spisula polynyma Stimpson. The photographic occurrence records on the chart, therefore, may include a few shells of the latter species.

For more information about the surf clam and its fishery, see: Turner, 1953; Merrill and Webster, 1964; Parker, 1966; Growlage and Barker, 1967; Parker, 1967; and Standley and Parker, 1967.

OCEAN QUAHOG

Mahogany Quahog, Mahogany Clam, Black Clam

The ocean quahog, Arctica islandica Linnaeus, occurs in North American waters from Newfoundland to Cape Hatteras, N. C. It is found at water depths between about 5 and 80 fathoms, and is most common in sandy mud substrates. Its shape is similar to the common quahog or hard-shell clam, Mercenaria (Venus) mercenaria Linnaeus, but the exterior surface of its shell is covered with a rather thick black periostracum.

The fishery for ocean quahogs began during 1953 in Rhode Island, and interest in this species has remained localized there and in

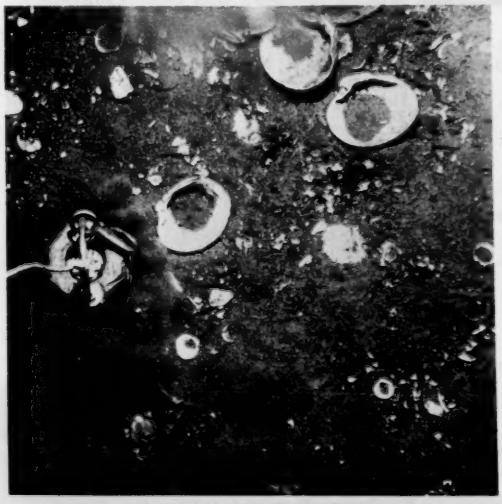


Fig. 9 - Ocean shells on the sea bottom off New Jersey (Lat. 39° 10.2' N., Long. 73°00.3' W.); taken by R/V "Gosnold" at station 1337; water depth 38 fathoms; bottom sediment brown muddy sand. Object at left is the camera tripping-weight, which has stirred up the sediment upon impact with the bottom.

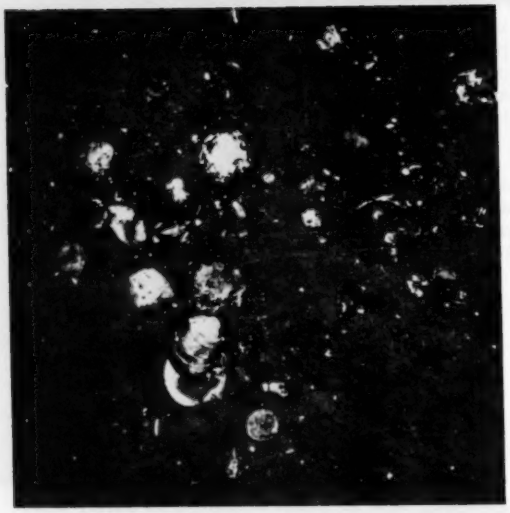


Fig. 10 - Ocean quahog shells on the sea bottom on eastern Georges Bank (Lat. 41° 10.2' N., Long. 66°31.2' W.); taken by R/V "Gosnold" at station 1125; water depth 52 fathoms; bottom sediment brown medium sand.

adjacent areas. The fishery has declined because of a decreasing demand for this product, rather than a reduction in the fishable stocks. Dense beds of ocean quahogs occur along large portions of the continental shelf, even in areas where it never has been commercially exploited. Parker (1967) stated: "From these sections [off Maryland], commercial fishermen can expect catches of about 15 bushels per 20-minute tow. . . ." Average market size of ocean quahogs is from 2 to 4 inches in length. They are brought to port whole, in bushel lots.

Ocean quahogs lie buried in the sediment just below the water-sediment interface, with the posterior end upward, in much the same position as hard-shell clams and surf clams. They are not visible (except for the siphons) from above the sediment surface; consequently, the photographs revealed only the shells of dead specimens (figs. 9 and 10).

Ocean quahogs can be harvested with hydraulic dredges, as used in the surf clam fishery, or by means of a toothed dredge designed specifically for catching this species. Toothed dredges range from 2 to 3 feet wide and 4 to 8 feet long. Steel teeth 7 inches long are spaced at intervals of $1\frac{1}{2}$ to 2 inches along the bottom forward edge. The retaining bag is made of 2-inch-diameter steel rings. Dredges are towed slowly along the bottom, usually by vessels 30 to 40 feet long.

For additional information, refer to: Arcisz and Neville, 1945; Merrill and Webster, 1964; and Parker, 1967.

LITERATURE CITED

ANDERSON, A. W. and E. A. POWER
1949. Fishery Statistics of the United States 1945. U. S. Fish and Wildlife Service, Statistical Digest 18, 372 pp.

1957. Fishery Statistics of the United States 1955. U. S. Fish and Wildlife Service, Statistical Digest 41, 446 pp.

ARCISZ, W. and W. C. NEVILLE
1945. Description of the Fishery. Pp. 7-14, In: The Ocean Quahog Fishery of Rhode Island. A Survey Conducted by the U. S. Department of the Interior, Fish and Wildlife Service, in Cooperation with the Division of Fish and Game of the Department of Agriculture and Conservation of the State of Rhode Island.

BOURNE, N.
1964. Scallops and the Offshore Fishing of the Maritimes. Fishery Research Board of Canada, Bulletin No. 145, 60 pp.

EMERY, K. O.; ARTHUR S. MERRILL; and JAMES V. A. TRUMBULL
1965. Geology and Biology of the Sea Floor as Deduced from Simultaneous Photographs and Samples. Limnology and Oceanography, Vol. 10, No. 1, pp. 1-21.

GROUTAGE, THOMAS M. and ALLAN M. BARKER
1967. The Surf Clam Fishery. U. S. Fish and Wildlife Service, Commercial Fisheries Review, Vol. 29, No. 2, pp. 55-58. (Also Sep. No. 780.)

ISELIN, C. O'D
1964. The Loss of the Thresher. Oceanus, Vol. 10, No. 1, pp. 4-6.

LYLES, CHARLES H.
1967. Fishery Statistics of the United States 1965. U. S. Fish and Wildlife, Service, Statistical Digest 59, 756 pp.

MERRILL, ARTHUR S. and J. A. POSGAY
1964. Estimating the Natural Mortality Rate of the Sea Scallop (Placopecten magellanicus). International Commission for the Northwest Atlantic Fisheries, Research Bulletin No. 1, pp. 88-106.

_____ and J. R. WEBSTER
1964. Progress in Surf Clam Biological Research. Pp. 38-47. In: The Bureau of Commercial Fisheries Biological Laboratory, Oxford, Maryland, Programs and Perspectives. U. S. Fish and Wildlife Service, Circular 200.

LITERATURE CITED (Contd.)

PARKER, PHILLIP S.
1966. Ocean Clam Survey Off U. S. Middle Atlantic Coast 1963. Commercial Fisheries Review, Vol. 28, No. 3, pp. 1-9. (Also Sep. No. 756.)

1967. Clam Survey Ocean City, Maryland, to Cape Charles, Virginia. Commercial Fisheries Review, Vol. 29, No. 5, pp. 56-64. (Also Sep. No. 791.)

POSGAY, J. A.
1953. The Sea Scallop Fishery. Commonwealth of Massachusetts, Department of Natural Resources, Division of Marine Fisheries. Sixth Report on Investigations of Methods of Improving the Shellfish Resources of Massachusetts. Pp. 9-24.

1958. Photography of the Sea Floor. Oceanus, Vol. 6 No. 1, pp. 16-19.

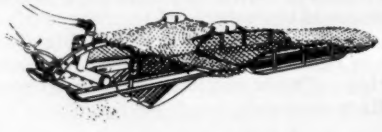
SCHLEE, JOHN
1967. Geology from a Deep-Diving Submersible. Geotimes, Vol. 12, No. 4. Pp. 10-13.

STANDLEY, MARK L. and PHILLIP S. PARKER
1967. Development of a Submersible Pumping System for a Hydraulic Surf Clam Dredge. Commercial Fisheries Review, Vol. 29, No. 6, pp. 50-55. (Also Sep. No. 793.)

TURNER, HARRY J., Jr.
1949. The Conservation Problem Associated with Possible Development of a Sea Clam Fishery in Massachusetts. Reference No. 49-17, Woods Hole Oceanographic Institution Report for Marine Fisheries Section, Massachusetts Department of Conservation, pp. 3-22.

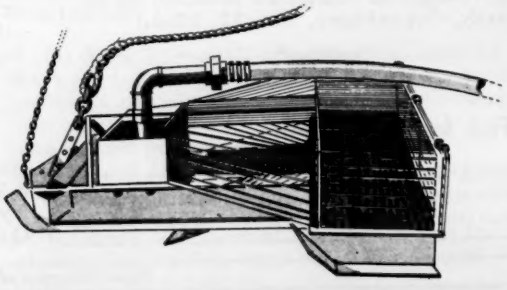
HYDRAULIC OR JET DREDGES

With this type of equipment, surf, soft, or hard clams are washed out of the bottom by action of jets of water from a pipe attached in front of the tooth bar. The pressured water is supplied by a high powered pump on the fishing vessel. The shellfish are then either washed on to, or collected by the tooth bar of the dredge. The Maryland type of hydraulic dredge utilizes a conveyer which brings the soft clams up to the vessel.



Hydraulic or jet dredge, surf clam

Hydraulic or jet dredge, soft clam



Hydraulic or jet dredge, hard clam

Note: Excerpt from Circular 109, Commercial Fishing Gear of the United States, for sale from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402, single copy 40 cents.

INTERNATIONAL

Plans for EEC Fisheries Policy Delayed

The development of the Common Fisheries Policy of the European Economic Community (EEC), the Common Market, is proceeding very slowly. According to reports from Brussels, it will not be possible to put the policies into effect by July 1, 1968, as presently scheduled. One reason is the problem arising within the Six following France's veto of negotiations to accept Great Britain, Denmark, Norway, and Ireland. The European Commission probably will not bring up controversial questions at a ministerial meeting in an already-difficult situation.

Proposals Under Study

On January 25, the EEC parliament was expected to discuss a delegation report but no decisive progress was expected. The EEC Commission worked out a detailed proposal for a fisheries policy for the Six, but it must be carefully examined before it can be presented in the Ministerial Council. The Economic and Social Council presented its views in February 1968 and did not agree with the Commission on some points. A working group within the Parliament's Agricultural Committee has since worked on the question and is now ready to present its views. (Regional Fisheries Attaché, U. S. Embassy, Copenhagen, Jan. 12, 1968.)

The Fish Meal Situation

World stocks of fish meal are high: 788,000 metric tons in major exporting countries on Nov. 1, 1967. On Nov. 1, 1966, stocks were 650,000 metric tons; on Nov. 1, 1965, 233,000 metric tons.

Peruvian production and export are high. U. S. production is relatively low because of decreased landings. U. S. and world prices are lower than usual.

The major cause of low prices is the high level of world production and stocks--at a time when production of other high protein feeds also has been high.

USDA Forecasts Increase in 1968 World Marine Oil Production

World output of marine oils in 1968 is expected to increase slightly over 1967, forecasts the U. S. Department of Agriculture. The expected increase reflects the expansion of fish oil production to a new record. Technical advances in recent years have increased the recoverable oil yield from fish. (The yield also varies with age of fish, season, and local conditions.)

Trade reports show that oil yields from Peruvian anchovy have been running at about 6 percent--higher than those of recent years. Production could be reduced if another strike occurs in Peru. But there are sizable fish oil stocks in Rotterdam and in major exporting countries. These would be enough to cover immediate demand.

Less Baleen Whale Oil

Baleen whale oil production likely will continue downward because of reduced quota of 3,200 blue whale units for 1967/68 season set by the International Whaling Commission. Quota was 3,500 units in 1966/67 season.

World Production of Marine Oil.

	Forecast 1968	1/1967	1966	1965	1964	1963	1962	1961	1960	Avg. 1960-64
	(1,000 Short Tons)									
Marine Oils:										
Whale	95	105	125	211	249	295	390	428	418	356
Sperm whale	160	160	161	170	165	149	130	120	122	137
Fish (incl. liver)	1,050	1,020	1,001	865	838	680	738	665	512	687
Total	1,305	1,285	1,287	1,246	1,252	1,124	1,258	1,213	1,052	1,180

1/Preliminary.
Source: Foreign Agricultural Service.

Sperm whale oil production is expected to remain stable. Production estimates for 1968 are 95,000 short tons of whale oil, 160,000 tons of sperm oil, and 1,050,000 tons of fish and fish-liver oil. ("World Agricultural Production and Trade, Statistical Report," U. S. Dept. of Agriculture.)

Commission Sets 1968 North Pacific Halibut Regulations

The International Pacific Halibut Commission (IPHC) concluded its Forty-fourth Annual Meeting in Seattle, Wash., Jan. 26, 1968.

The Commission dealt with administrative matters during executive sessions and approved a research program for 1968. The program continues the 1967 program of tagging and assessing of possible effects of foreign fishing on halibut stocks in Bering Sea and the Gulf of Alaska.

The Commission expressed concern about the effect on halibut stocks of increased trawling for other bottomfish. It also has drawn the attention of the two Governments to trawling's effect on the large population of small halibut in southeastern Bering Sea. This area has been set aside as a nursery area and all fishing for halibut in this region again has been prohibited in the proposed 1968 regulations. The Governments of the U. S. and Canada also have been advised that any additional protection afforded the large population of young halibut in the flats of southeastern Bering Sea would be beneficial.

Particular concern was expressed for the failure of stocks in Area 2 to respond to reduced removals from that area in recent years. If the stocks fail to respond adequately in 1968, more restrictive measures will be necessary.

Proposed 1968 Regulations

In view of the scientific findings and conferences with the industry, the Commission is recommending to Canada and the U. S. regulations for the 1968 fishing season that do not differ drastically from 1967 regulations. Exceptions are earlier opening dates for Areas 2, 3A, and 3B.

(1) For 1968 the regulatory areas shall be: Area 2 - All convention waters south of Cape Spencer, Alaska. Area 3A - between Cape Spencer and Shumagin Islands. Area 3B - Shumagin Islands to Atka Island, not including Bering Sea. Area 3C - west of Atka Island, not including Bering Sea. Area 4A - the Bering Sea edge - Unimak Pass to Pribilof Islands. Area 4B - Fox Islands grounds, Bering Sea. Area 4C - edge grounds and the Bering Sea side of the Aleutian Chain between 170° W. and 175° W. Area 4D - Bering Sea east of 175° W. and north of a line between Cape Newenham and St. Paul Island and waters west of 175° W. (The flats in southeastern Bering Sea east of Area 4A and south of a line between the Pribilof Islands and Cape Newenham have been declared a nursery area and are closed to all halibut fishing.)

(2) The opening and closing hours of the various regulatory areas shall be 6 p.m. Pacific Standard Time of the date indicated. Exceptions: Areas 3C, 4A, 4B, 4C, and 4D, where they shall be open at 3 p.m. and closed at 6 p.m. local time.

(3) Area 2--shall open on May 4 and shall close at the time of attainment of a catch limit of 23 million pounds, or on October 15, whichever is earlier.

(4) Area 3A--shall open on May 4 and shall close at the time of attainment of a catch limit of 32 million pounds, or on October 15, whichever is earlier. This represents a reduction in the catch limit of 1 million pounds.

(5) Area 3B--shall open first on April 14 for a period of 4 fishing days and open again on May 4 and close at the time of attainment of a catch limit of 3.5 million pounds inclusive of that poundage taken during the first season of 4 days or on November 15, whichever is earlier.

(6) Area 3C--west of Atka Island not including Bering Sea, open on March 29 and close on November 15.

(7) Area 4A--the Bering Sea edge, Unimak Pass to Pribilof Islands--shall open on April 3 and close on April 17.

(8) Area 4B--Fox Islands grounds, Bering Sea--shall open on September 1 and close September 10.

(9) Area 4C--edge grounds between Pribilof Islands and 175° W.--shall open on March 29 and close on April 22.

(10) Area 4D--east of 175° W. and north of a line between St. Paul Island and Cape Newenham and waters of Bering Sea west of 175° W.--shall open on March 29 and close on November 15.

The Commission will provide 10 days' notice of closure of Area 2; and 18 days' notice of closure of Area 3A; and at least 18 days' notice of closure of Area 3B in 1968.

The Commission decided that the next annual meeting will be held in Seattle, Wash., beginning January 21, 1969. Harold E. Crowther of Washington, D. C., was elected Chairman and Frank W. Millerd of Vancouver, B. C., Vice Chairman for the ensuing year. (IPHC, Jan. 26, 1968.)

More Nations Sign N. Atlantic Fishing Operations Convention

Eleven more countries have signed the Convention on Conduct of Fishing Operations in the North Atlantic. Italy, West Germany, Belgium, Norway, Denmark, Sweden, Canada, Ireland, the Netherlands, Poland, and Spain signed recently.

France, Iceland, Portugal, the United Kingdom, and the USSR signed earlier.

Poland, Spain, and the USSR signed with reservations. (U. S. Embassy, London, Jan. 23, 1968.)

Northeast Atlantic Enforcement Scheme Stalled

The Northeast Atlantic international fisheries enforcement scheme may not go into effect because Poland, Sweden, and the USSR have formally objected to the inclusion of an international enforcement article in the Convention of Fishing Operations in the North Atlantic. Therefore, this article will not come into effect as scheduled. The Netherlands has requested that the question be raised again at the next meeting of the Commission scheduled for May 1968 in Iceland. (U. S. Embassy, London, Feb. 2, 1968.)

UN/FAO Caribbean Project "Calamar" Is Active

From September-December 1967, the "Calamar," one of 3 vessels in the UNDP/FAO Caribbean Fishery Development Project, completed 5 cruises. About half the time went into exploration and half into production fishing. She explored much of the area between 9 and 30 fathoms along the coast of northeastern South America, from Trinidad to French Guiana. About 65 tons of marketable fish were taken. The nets used were "high opening" type trawl.

The catches were 60 percent sea trout (Cynoscion virescens), 14 percent croakers (Micropogon furnieri), and 25 percent other mixed fishes. About 50,000 pounds of catfish (Arius sp. and Felicthys sp.), sharks, rays, small Sciaenids, and other small fish were caught, but they were not saved for marketing. A giant devil ray (Manta birestris) weighing about 2,000 pounds, 9 marine turtles, 2 conger eels (Muraenesox sp.), and small amounts of shrimps were taken during the period, incidental to trawlfish operations.

Good Catches NE of Paramaribo

Good catches were made consistently in the area northeast of Paramaribo, Surinam, in 9 to 15 fathoms. About 100,000 pounds of marketable fish, or three-fourths of the total marketable catch, were taken here in 184.4 hours of fishing (66.3 percent of total fishing time during this period). The average catch rate was 9 pounds per minute of fishing (539.9 lbs./hr.). The catches included about 73 percent sea trout, 12 percent croakers, and 14 percent other mixed fish.

The area north of St. Andrews Point, Guyana, in 9 to 19 fathoms, yielded high catches. (Average 11.9 lbs./min., or 711.6 lbs./hr.). These were principally sea patwa (Gerres rhombeus), apparently a schooling fish; catches were not consistent. There were also good catches northeast and east of Waini Point, Guyana.

1 Net Lost, 1 Ripped Badly

During exploratory fishing north and east of Trinidad, a net was lost at 22 fathoms (Position: Lat. 10°54' N., Long. 61°12.5' W.) after hanging up on a wreck. Another net was ripped badly in 14 fathoms (Lat. 10°35' N., Long. 60°56.8' W.). Hard bottom, many wrecks, and strong currents hampered trawling. Catches included over 50 percent "moonshine" (Selens vomer); also lane snapper, bluefish (Pomatomus saltatrix), and large flatfish (Paralicthys sp.) up to 2 pounds were conspicuous.

In cooperation with the project's marketing sector, landings of trawl-caught fish were made at Port-of-Spain, Trinidad, Point-a-Pitre, Guadeloupe, and Bridgetown, Barbados.

Oceanographic Work

To understand oceanographic conditions better, drift bottles were released, and water temperature and salinity data collected. Length frequencies of fish and other biological data were recorded. Numerous sharks were tagged and released for growth and migratory studies.

Trawling cruises in the same general area are continuing in early 1968. Emphasis is being placed on expanding coverage--and in developing information on the seasonal changes in species composition and abundance at certain key locations. (Cruise Report No. 8, UNDP/FAO Caribbean Fishery Development Project, Barbados, Jan. 15, 1968.)

Poland and Canada May Exchange Fishery Enforcement Officers

In summer 1967, officials of the Canadian Department of Fisheries approached Polish officials to arrange an informal exchange of enforcement officers. The purpose was to familiarize each country with the way the other enforces regulations of the International Commission for Northwest Atlantic Fisheries (ICNAF). Canada, the U. S., and the USSR have done this in the past. This is the same type of exchange that the U. S. and the USSR conducted in ICNAF subareas 4 and 5 in June 1965. Although such arrangements are endorsed by ICNAF, they are not a joint bilateral enforcement scheme.

Spring Exchange Likely

In September 1967, an enforcement officer aboard a Polish trawler contacted Department of Fisheries officials at St. John's, Newfoundland, but it was not convenient at that time to make the exchange. It is expected that in Spring 1968, when weather in the Northwest Atlantic improves, Canada and Poland will cooperate in this informal exchange of fishery enforcement officers. (Regional Fisheries Attaché, U. S. Embassy, Copenhagen, Jan. 19, 1968.)

Mexico and Japan Agree on Fishing Off Mexico

On Feb. 2, in Tokyo, representatives of Mexico and Japan announced agreement on continuing Japanese fishing off Mexico. The 5-year agreement should be signed in the near future.

The main points cited were: (1) The agreement deals primarily with long-lining for tuna and related species (such as big-eyed, yellowfin, marlin, and swordfish) in the 9-12 mile zone off Mexico's Pacific coast. There the annual Japanese catch will be limited to 15,500 metric tons. (2) The Japanese will not fish near tourist resorts where sport fishing is important. (It is not known whether the Japanese have agreed to refrain from fishing beyond 12 miles in these sensitive areas.) (3) Japanese fishermen will use the same gear they now use. (4) The agreement does not change either country's position on the width of territorial waters, or jurisdiction over fishing by a coastal state. (5) On the Atlantic Coast, there will be no Japanese fishing within 12 miles. ("Excelsior," Feb. 3; Regional Fisheries Attaché, U. S. Embassy, Tokyo, Feb. 7, 1968.)

Sign Southeast Asian Fishery Development Central Pact

A 6-nation agreement to establish the Southeast Asian Fishery Development Center

in Bangkok, Thailand, was initially signed there by Japan, Thailand, and Singapore on Dec. 28, 1967. South Vietnam, the Philippines, and Malaysia signed on Jan. 13, 1968. Several other southeast Asian nations, which had sent observers to the 1967 organization meetings, have not yet signed.

Research in Singapore

Under the agreement, a training center will be set up in Thailand, and a research center in Singapore. Japan will contribute experts, vessels, and gear worth about US$1.1 million. Thailand will contribute buildings and land for the center. ("Katsuo-maguro Tsushin," Jan. 19, 1968, and other sources.)

Survey Indonesian Fishing Grounds

South Korea and Indonesia will conduct a joint fishing survey of Indonesian fishing grounds, from North Sumatra to Halmahera, beginning early in 1968. The 1-year survey was agreed on by the Shin Hung Refrigeration Co. of South Korea and the P. T. Nasantara Djaja Trading Co. of Indonesia.

Shin Hung will provide 40 vessels for the survey and give on-the-job training to Indonesians at sea and at processing plants in Korea. The first 5 vessels of the survey fleet arrived at Tandjung Priok, Djakarta, in January 1968. (U. S. Embassy, Djakarta, Nov. 10, 1967, and Jan. 16, 1968.)

Japanese-Italian Tuna Mothership Reports Good W. African Fishing

The 1,294-gross-ton, portable-boat-carrying tuna mothership, "Tuna No. 1", reported good fishing in early January 1968 in the Gulf of Guinea off West Africa. It averaged 8.5 metric tons (predominantly yellowfin) per set.

The vessel is owned jointly by Hoko Suisan Fishing Co. and an Italian firm. It departed Italy for West African waters in October 1967. So far, it has made 40 sets and is expected to attain its catch target of 850 tons by the end of March 1968. The catch will be brought to Las Palmas, Canary Islands, for transshipment to Italy.

The Joint Company

The joint company, established in Italy, became operative in July 1967. The 2 parties had agreed that the Japanese firm would fish and the Italian partners would sell the catches to Italian packers. ("Katsuo-maguro Tsushin," Jan. 17, 1968, and other sources.)

FAO Conference on Fishing Research Vessels — Seattle, May 18-24

Fishing research vessels will be subject of the Second FAO Technical Conference on Research Vessel Craft to be held at the Pacific Science Center in Seattle, Wash., May 18-24. The Conference is cosponsored by BCF and FAO's Fisheries Division. Jan-Olof Traung, Chief of FAO's Fishing Boat Section, will coordinate conference.

The planners expect several hundred participants from many nations to discuss: "vessel requirements as related to work objectives, vessel requirements as related to operational conditions, general operational problems, operational costs versus scientific output, and new methods of data retrieval from the oceans." Also to be examined are "problems of working at sea and general problems of platforms from which increased knowledge of the ocean's biological potential can be acquired."

The First Research Vessel Design Forum was held in Tokyo in September 1961. Twelve nations participated.

A conference spokesman said the May meeting will interest all leading fishing nations and those doing general oceanographic research. He hopes that several U. S. and foreign research vessels will be available to the conference.

For information, write to Donald Johnson, Regional Director, BCF, Seattle, Washington 98105.

Sockeye and Pink Salmon Predictions for 1968

The International Pacific Salmon Fisheries Commission predicts an off-year for sockeye salmon catches but a good year for pinks. This year is expected to be poor for all Fraser River sockeye races, except possibly the Chilko. Sockeye production in the Skeena system may be better than average but not as good as 1967.

The U. S. and Canada each may harvest a sockeye catch of 500,000 fish in Convention waters. Strong runs of pink salmon are predicted from northern Queen Charlotte Islands south to Johnstone Strait. The Skeena system expects a run of 1.9 million pinks. ("Facts on Fish," Jan. 26, 1968.)

FAO Orders 2 Multipurpose Fishing Vessels in Norway

The Food and Agriculture Organization of the United Nations has ordered 2 multipurpose fishing vessels from a Norwegian shipyard for delivery late this year and early 1969. The 107-foot vessels will be equipped for trawling and purse seining. They will be used to develop pelagic fishing off Colombia and Argentina under the auspices of FAO and oceanographic research institutes of the two nations.

The vessels also are to be equipped for training deep-sea fishing crews and for oceanographic research. Each vessel will have cabins for 18. Freezing holds will measure 127 cu. meters. Most fishing gear will be Norwegian make. (Export Council of Norway, Feb. 1968.)

Symposium on Marine Food Chains, Denmark, July

An International Symposium on Marine Food Chains (Tropho-Dynamics of Marine Communities) is scheduled for July 23-27, 1968, in Aarhus, Denmark. It is being held under the auspices of tne International Council for the Exploration of the Sea (ICES) with the support of FAO, UNESCO, and ICNAF.

The tentative program is: (1) Biological variations and behavior relevant to feeding, capture, and reproduction, (2) Food web structure, particularly covering the re-use of non-living organic matter, the benthos, and the food requirements of fish stocks, (3) Methods for measuring field indices of viability and productive potential, and experimental studies pertinent to food chain dynamics, (4) Theoretical and experimental models for developing and testing concepts in tropho-dynamics. (ICES)

17th Int'l Congress of Limnology, Jerusalem, August

Jerusalem is the meeting place for the 17th International Congress of Limnology, Aug. 12-19, 1968. Several hundred delegates are expected to attend.

The agenda includes 2 lectures: the Baldi Memorial Lecture, and one on The Dead Sea. Symposia include Salt and Brackish Inland Waters, Tropical and Subtropical Lakes, and the Fish Pond as a Limnological Model. (U. S. Embassy, Tel Aviv, Feb. 6, 1968.)

North Pacific Fur Seal Commission to Meet in Moscow

The eleventh annual meeting of the North Pacific Fur Seal Commission (Canada, Japan, U. S., and USSR) will be held in Moscow starting April 8, 1968. The Commission will consider whether pelagic sealing, prohibited under the Convention, can be allowed under certain conditions without endangering fur-seal populations.

The member nations had agreed to allow the U. S. and the USSR to harvest the animals on land--and that Canada and Japan were each to receive 15 percent of the annual take of seal skins.

Japan Dissatisfied

Japan is strongly dissatisfied with the Convention's restriction on pelagic sealing. She can be expected to insist on permitting this method of harvesting. She claims that North Pacific fur seals have increased significantly

in recent years. She maintains they are causing damage to fishery resources through predation on North Pacific salmon and other fish off northeastern Japan.

Japan Supports Pelagic Sealing

Japan's position supporting pelagic sealing is: (1) years of study have shown that seals captured at sea produce better quality skins; (2) the improved capturing technique developed in recent years will reduce loss in seal skin value resulting from skin puncture; it will minimize retrieval problems caused by sinking of killed animals; and (3) better knowledge has been gained on fur seal habitats; this will help resolve the problems associated with pelagic sealing. ("Suisan Keizai Shimbun," Feb. 8, 1968.)

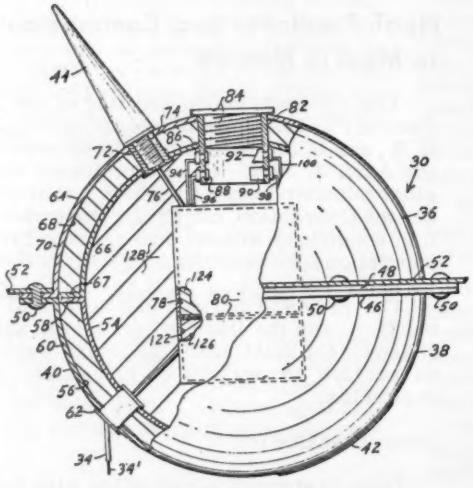
NEW BOOK ON NORTH PACIFIC FISHERIES TREATIES

The School of Law, University of Washington (Seattle), has published a book that "is the most comprehensive symposium of the legal, political, and economic aspects of fisheries in the North Pacific that has ever been published . . . a valuable guide for legal scholars, politicians, economists, the fishing industry, and others who are interested in international fisheries."

"North Pacific Fisheries Symposium," 1967, 307 pp., $3.50.

RESCUE BEACON FOR ALL CRAFT

"An emergency radio beacon for any land, sea or aircraft designed to begin transmitting automatically if the vehicle crashes or is damaged (as from fire) was patented recently by Calvin L. Yandell of Fontana, Calif. The unit is 'shockproof, fireproof and foolproof,' says the inventor, and will work even if it is thrown completely clear of the vehicle. The unit, which looks rather like a World War II mine, goes on when a cable that extends along the vehicle is broken, or it can be turned on manually.



"Half a dozen layers of casing and insulation are intended to armor the transmitter against just about anything, possibly including even a direct hit. The outermost layer is noncorroding metal, to protect the unit from exposure. Next comes a thick heat shield of granulated asbestos, a second layer of metal, a shock-absorbing jelly, the steel housing for the transmitter, an electrically insulating material that fills all the empty space in the housing and the radio itself."

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FOREIGN

CANADA

SEAL SEASON SHORTENED

The 1968 sealing season in the "Front" area on Canada's east coast--the Labrador and eastern Newfoundland coastline--will be shortened by 15 days, and in the Gulf of St. Lawrence by 11 days.

By international agreement, Canada and Norway will begin to take harp and hooded seals on the "Front" March 22, ten days later than in 1967. The area will close on April 25, five days earlier than last season.

ICNAF Conservation Measures

Discussions of seal conservation measures were initiated at the annual meeting of the International Commission for the Northwest Atlantic Fisheries (ICNAF) at Boston, Mass., in June 1967. These were followed by a meeting of interested countries at Hamburg, Germany, in October 1967.

In the Gulf of St. Lawrence, where Canada alone takes seals, the 1968 season will open March 18 (it opened on March 7 in 1967). It will close on April 25, as last season. (Canadian Department of Fisheries, Dec. 27, 1967.)

* * *

MAY ESTABLISH A NEW MARKETING AGENCY

Canada may establish a freshwater fisheries marketing agency to assist that sector of the fishing industry, which is having difficulties, particularly in selling to the U. S. market. Discussions about creating such an agency began in fall 1966. The latest series of talks was scheduled for February 1968, when officials of the Federal-Provincial Freshwater Fisheries Committee were to meet. (Dept. of Trade and Commerce, Canada, Jan. 24, 1968.)

* * *

FUR SEAL PRICES RISE SLIGHTLY

At the Jan. 25, 1968, fur seal sale in Montreal, prices advanced somewhat over the previous Canadian sale in September 1967. Price comparisons (in U. S. dollars) are shown in table. Also included are the prices received at the most recent U. S. sale in September 1967.

	Canada		U. S.
	Jan. 1968	Sept. 1967	Sept. 1967
Dressed, Dyed, Machined, Finished. Lakoda (Sheared):	$ 79.45	$ 69.59	$ 82.73
Natural	30.80	23.42	31.84
Sandrift	41.33	None sold	86.20

* * *

1967 COLD-STORAGE HOLDINGS

Canada's Bureau of Statistics reported on Jan. 29, 1968, cold-storage holdings of selected fishery products on Dec. 31, 1967, and 1966:

	Dec. 31 Stocks	
	1/1967	1966
	. . . (1,000 Lbs.) . . .	
Halibut Pacific:		
dressed	8,652	8,445
fillets	301	191
steaks	72	57
Salmon Pacific	6,248	8,624
Fillets:		
Atlantic cod	1,629	4,074
Haddock	2,139	2,445
Ocean perch	6,026	6,494
Soles2/	6,891	5,751
Blocks and slabs	12,227	17,180
Fish sticks	341	594
Portions	952	690
Scallops	526	1,900
Other frozen fish and shellfish	21,461	20,639
Total frozen fresh	67,465	77,084
Total smoked	1,382	1,376
Total bait and animal feed	14,906	15,478
Grand Total	83,753	93,938

1/Preliminary.
2/Including all small flatfish.

* * *

GOVERNMENT PRINTS BOOKLET ON CARE OF FISH IN RETAIL STORES

A 24-page booklet, "The Care of Fish in Retail Stores," published recently by the Canadian Department of Fisheries, has been well received by retailers and food distributors.

The booklet contains information useful to retail outlets and supermarkets. The meat manager of a Toronto supermarket chain said the booklet will help sell more fish by better informing retail sales personnel on the quality of fish, how to display it, and how to care for fresh and frozen fish.

Copies are free and may be obtained from the Information and Consumer Service, Department of Fisheries, Ottawa, Province of Ontario, Canada. ("Fisheries of Canada," January 1968.)

EUROPE

1967 Salmon Catch Off Greenland Near 1964 Record

The 1967 catch of salmon in Greenland waters will total about 1,360 metric tons, close to the record 1964 catch of 1,387 tons. The offshore fishery catch more than tripled the 1966 figure. It was due to greater Norwegian and Danish participation.

Preliminary Greenland Salmon[1/] Catch, 1967 and 1966

	1967		1966	
	(Metric Tons)			
Shore fishery:				
Purchases by:				
Royal Greenland Trade Dept.		589		614
Private operators		491		533
Total		1,080		1,147
Offshore fishery:				
Norwegian vessels	(4 vessels)	100	(1 vessel)	18
Faroese "	(3 ")	100	(1 ")	70
Danish drift-netters	(4 ")	80	(no vessels)	-
Total		280		88
Grand Total		1,360		1,235

1/Eviscerated fish with heads on.

Poor Weather Reduced Catch

Although more vessels participated in the 1967 offshore fishing, extremely poor weather reduced fishing effectiveness. Gill nets are fished at the surface and tend to tangle in bad weather. They also drift readily and prove very hard to recover at times.

About 100 salmon tagged as smolts were recaptured in the West Greenland fishery. No information is available yet on countries of origin.

Tagging Program

The ICES/ICNAF joint onshore tagging program successfully tagged 370 salmon. Northumberland T-nets were tried in an attempt to secure an increased percentage of taggable fish. This gear, a floating trap net with lead running to the beach, proved relatively ineffective. This was due partly to poor weather and rough seas. (Regional Fisheries Attaché, U. S. Embassy, Copenhagen, Jan. 21, 1968.)

Iceland

1967 CATCH DECLINES

Iceland's total 1967 catch of about 901,000 metric tons was 27.3 percent below the 1966 catch of 1,240,000 tons. Contributing factors were difficult weather conditions and the unpredictable movements of herring shoals.

The 1967 catch was slightly less than the 971,600 tons of 1964--and well under the record catches of 1965 and 1966.

	1967	1966
	(1,000 Metric Tons)	
Herring	470	769
Capelin	97	125
Groundfish	330	339
Lobster & shrimp	4	5

Although a final estimate is not yet available, it is assumed that the manufacture of fishery products (output) for 1967 declined by at least the same percentage. (U. S. Embassy, Reykjavik, Jan. 18, 1968.)

* * *

TEMPORARY SOLUTION FOUND TO FISH PLANT SHUTDOWN

In the last week of January 1968, the Freezing Plants Corporation and the Icelandic Federation of Cooperative Societies shut down their member plants due largely to operating deficits. In recent discussions with these groups, the Government proposed as its final offer subsidy assistance of 199 million kronur (US$3.5 million). Although the plants rejected this proposed sum as "unacceptable," they agreed to resume production on the basis of the Government's proposals only during the 1968 winter fishing season.

An earlier Government decision to increase 1968 prices on raw white fish by 10 percent above 1967 prices (including subsidies) increased in effect raw material costs to freezing plants. (This happened at the same time Government subsidies were to be abolished.) The action brought on the plant shutdown.

Assistance Exceeds Budget Surplus

In addition to plant assistance, the Government proposed 124 million kronur ($2.2 million)

Iceland (Contd.)

for fishing vessel owners to help meet interest and loan repayments on capital investment. Thus, total assistance to the fisheries is projected at 323 million kronur ($5.7 million). This is a good deal more than the anticipated 250 million kronur ($4.4 million) budgetary surplus estimated for 1968. The surplus had been earmarked to compensate for loss of revenue from proposed tariff reductions.

To Curb Treasury Outlays

In a press interview on Jan. 30, 1968, the Minister of Finance stated that it had been "hoped the devaluation would suffice for the fisheries, although it was clear that the freezing plants would not be satisfied without some transfer payments. It was also known that the fisheries owners would have to be supported if the lot of the fishermen were improved." As to how the Government is going to finance assistance to the fisheries, he stated that "a drastic revision of all state expenditures along with measures to curb Treasury outlays could not be avoided."

Dropping proposed tariff reductions is not feasible, according to the Government, because early reductions are inevitable in order to bring Icelandic tariffs into line with existing tariffs in other countries. Reductions also are necessary to arrive at acceptable agreements with EFTA and EEC. (U. S. Embassy, Reykjavik, Feb. 1, 1968.)

United Kingdom

INTEREST IN OCEANOGRAPHY GROWS

The Natural Environment Research Council (NERC) reports growing interest in marine sciences. The NERC considers itself the "prime coordinator of marine scientific research" in the United Kingdom.

NERC's second annual report (for April 1, 1966-March 31, 1967) reviews the Council's efforts to examine and coordinate its different research programs and to develop policies. Major new developments are planned in 4 previously neglected areas: (1) coastal oceanography, (2) coastal geology and ecology, (3) geology of the continental shelf, and (4) hydrology and biology of inland waters.

Funds for Research

In oceanography and fisheries, the Council urges increased effort. After a national review of potential economic and scientific benefits, the NERC expects to double its financial support of research in the marine sciences in the next 4 years. From US$4.2 million in 1966-67, support will increase to about $9.8 million in 1972. This is considered the maximum consistent with available staff and facilities. Increased aid already has been given to university postgraduate programs and to improve research facilities.

5 Vessels Needed

NERC anticipates a need for 5 new research vessels over the next 5 years: one for biological and a second for geological research, to be used jointly with the universities; 2 smaller vessels for coastal work; and a 2-man submersible capable of operating at 100 fathoms along with a support vessel.

The British Antarctic Survey, a recent addition to NERC, also is expected to need a new vessel by about 1970. It is likely that the Survey will expand its oceanographic research in the Antarctic.

The interest of NERC in marine sciences as a source of future economic and scientific benefits is endorsed by the Council for Scientific Policy. The Council has recommended in its latest report on science policy that NERC's budget be increased at a yearly average of 16.5 percent over the next 3 years. (U. S. Embassy, London, Jan. 27, 1968.)

USSR

NEW AQUARIUM NEAR BLACK SEA

A large aquarium has been built at Batumi, Georgian Republic, on the shores of the Black Sea. It has over 2,000 fish from the Black Sea and inland waters of the Caucasus. Scientists from the Georgian Fisheries Research Laboratory will conduct basic research on the nearly extinct Atlantic sturgeon. This fish can weigh up to 600 lbs. (Caspian sturgeon reach only 110 lbs.) The Atlantic sturgeon

USSR (Contd.):

yields 5 to 6 times as much caviar as the Caspian. Only about 1,000 specimens of Atlantic sturgeon are known to exist in the mouth of the Rioni River, where the Soviets plan to build a sturgeon hatchery.

Caspian and Pacific fur seals also are being studied at the aquarium. Both species have been kept alive in captivity. Both readily eat frozen fish, although prior Japanese research indicated fur seals are more demanding about their food. The Soviets hope that both species will reproduce in captivity and establish a basis for commercial breeding. ("Trud," Dec. 19, 1967.)

Portugal

CANNED FISH PACK UP, EXPORTS DOWN

The Portuguese publication "Conservas de Peixe," Nov. 1967, reported the pack and export of canned fish in Jan.-Sept. 1967 and 1966:

	Pack			
	1967		1966	
	Jan.-Sept.		Jan.-Sept.	
	Metric Tons	1,000 Cases	Metric Tons	1,000 Cases
In oil or sauce:				
Sardines	26,496	1,394	26,984	1,420
Chinchards	2,378	125	1,104	58
Mackerel	6,540	261	5,994	240
Tuna & tunalike	6,165	206	3,490	116
Anchovy fillets	3,467	347	3,688	369
Others	1,187	63	704	37
Total	46,233	2,396	41,964	2,240
	Exports			
Sardines	36,824	1,938	36,262	1,908
Chinchards	1,200	63	492	26
Mackerel	4,782	191	7,623	305
Tuna & tunalike	1,582	53	2,109	70
Anchovy fillets	3,199	320	2,988	299
Other	643	34	597	31
Total	48,230	2,599	50,071	2,639

Denmark

NEW SHRIMP FISHERY POSSIBLE

Exploratory fishing has demonstrated the existence of commercial stocks of brown shrimp (Crangon vulgaris) in shallow protected waters between Esbjerg and Havneby, Denmark. Denmark has not used this species, although it is highly regarded in Germany, France, Belgium, and the Netherlands. The exploratory effort was inspired by cooperation between one of West Germany's largest shrimp suppliers in Cuxhaven and an Esbjerg exporter. The Cuxhaven firm agreed to purchase all brown shrimp the Danish fishery could produce.

Dutch Trawl Used

Biologists at the Danish Ministry of Fisheries originally opposed beam-trawling for shrimp in the shallow-water areas off Denmark's west coast. They feared the likelihood of damage to substantial stocks of young fish that use these waters for rearing. The beam-trawl was tested. So was a specially built "shovel trawl." But attention centered quickly on the Dutch double cod-end beam trawl. This separates the shrimp from the small fish and permits the fish to escape. (For description of this net, see "World Fishing," June 1965.)

Tests of the new Dutch trawl demonstrated its suitability for Danish conditions. A biologist-observer of the exploratory fishing was enthusiastic about the gear. (Regional Fishery Attaché, U. S. Embassy, Copenhagen, Jan. 30, 1968.)

Norway

POSSIBLE DEPLETION OF SALMON STOCKS FEARED

An expanding salmon fishery off the Norwegian coast from Bergen to Finnmark has caused concern in fishing circles that the country's valuable salmon stocks are being depleted. The chief of the Norwegian Directorate for Hunting, Wildlife, and Freshwater Fisheries says there is clear evidence that salmon are being overfished as a result of the new fishery. Because salmon propagation work takes place only in rivers, he points out, rivers should be assured an adequate part of the run. Instead, the river part of the catch has declined from 15 percent to 10 percent in the last decade. The chief noted that the new fishery can only be regulated by international agreement. He urged that negotiations

Norway (Contd.):

begin soon with Denmark, Canada, and the Soviet Union.

Fishery Fairly New

The fishery began in the early 1960s as a drift-net fishery, but several Danish long-line boats participated in 1966. In 1967, about 20 Danish long-liners, one or two Swedish boats, and some Faroese and Norwegian vessels, fished salmon in the area. The vessels fished from about 12 miles to 200 miles offshore. They began in April and continued through most of June.

Preliminary data show a catch of 100 to 200 metric tons in 1967. More vessels, particularly Norwegian, are expected to participate during 1968. Several fishermen from the Danish port of Esbjerg plan to return to North Norway this year. They have been negotiating to convert a large steel cutter to mothership operations. This would save much time and many trips from fishing grounds to Denmark--because Norway does not permit the Danes to land their catches for transshipment. (Regional Fisheries Attaché, U. S. Embassy, Copenhagen, Jan. 30, 1968.)

* * *

PRICE DECLINE HITS KLIPFISH EXPORTS

Norwegian exports of klipfish (dried, salted cod) for 1968 are expected to total about 40,000 metric tons, about the same as in 1967. However, the value probably will be much lower because of declining prices for it on the world market. The Norwegian market in Brazil particularly has been affected by lower prices.

Depressed world prices for klipfish may be a result of competitive sales by Faroese and Icelandic suppliers. The latters' position has been enhanced by currency devaluation. (Regional Fishery Attaché, U. S. Embassy, Copenhagen, Jan. 30, 1968.)

* * *

REPORT ON 1966-67 LANDINGS AND VALUE

The Norwegian publication "Fiskets Gang," Dec. 28, 1967, reports these data on landings and value for 1966 and 1967:

	1/1967		2/1966	
	Quantity	Value	Quantity	Value
	Metric Tons	US$ 1,000	Metric Tons	US$ 1,000
Herring	1,206.3	38,230	1,185.8	56,784
Mackerel	881.2	27,436	483.9	25,659
Capelin	402.8	5,859	379.6	9,541
Saithe	123.9	12,079	142.6	13,461
Cod	192.4	35,565	197.0	36,853
Other	209.3	39,608	264.7	45,448
Total	3,015.9	158,777	2,653.6	187,746

1/Preliminary.
2/Revised.

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USE OF INDUSTRIAL FISH LANDINGS IN 1967

Norway's utilization in 1967 of industrial fish landings by selected species is reported by "Fiskets Gang," Jan. 4, 1968:

	Total Landings	Iced Fresh		Freezing		Salted	Canned	Animal Food	Meal & Oil
		Export	Domestic	Edible	Bait				
	(1,000 Metric Tons)								
Herring	1,199.4	19.9	4.0	33.5	6.5	31.7	18.4	0.1	1,085.2
Capelin	415.3	-	-	-	-	-	-	-	415.3
Norway pout	21.8	-	-	-	-	-	-	9.8	12.0
Brisling	74.5	2.7	-	-	-	0.1	69.9	0.5	1.2
Mackerel	77.7	0.1	0.3	1.1	0.3	0.3	0.2	-	75.3

Note: Original data converted from hectoliters (hl.) using 93 kilos=1 hl. for all species except capelin (100 kilos=1 hl). Totals may not add due to rounding.

LATIN AMERICA

Peace Corps Wants 60 Biologists for Fisheries Projects

The Peace Corps is seeking 60 "qualified, fisheries-oriented" biologists to work in fisheries development programs in Chile and Central America. The programs will be associated with FAO fishery development projects.

Training will begin in June 1968. Primary study areas in current projects are: development of fishing production cooperatives; fishery research and fish culture efforts; and fishing community development. The 3-month training program in the U. S. includes language and study of fisheries in the countries to which volunteers are assigned for 2 years. They will work closely with native fishermen and officials.

Where Application Forms Available

Application forms are available at U. S. Post Offices and at Civil Service Commission offices. Applicants should apply soon to be considered for the June training programs. They should pay special attention to Question 14--"Area of Preference"--and state their interest in going to Latin America.

For more information, write to: Norman Moe, Peace Corps/Chile, Room 419, The Peace Corps, Washington, D. C.; or Harold Loesch, FAO Central American Fisheries Development Project, Room 344, The Peace Corps, Washington, D. C.

Mexico

CONSUMPTION OF SHRIMP INCREASES

Between 1957 and 1966, Mexican consumption of shrimp increased about 9 percent each year. This fact is notable because it shows increasing consumption of domestically produced fish. Domestic consumption was about 18 percent of total Mexican production over the past 10 years, but this has increased in recent years. For example, domestic consumption was 20 percent of the catch in 1963, 23 percent in 1964, 24 percent in 1965, and 25 percent in 1966. Per-capita consumption of shrimp rose from $\frac{1}{3}$-lb. in 1957 to over $\frac{1}{2}$-lb. in 1966. ("Actividad Pesquera," Nov. 10, 1967.)

* * *

CATCH WAS UP IN FIRST 9 MONTHS OF 1967

The Mexican fishery catch from January-September 1967 totaled 168,892 tons--19,753 tons above the 1966 period.

The greatest catch increases were: sardine, 63 percent; anchoveta, 83 percent; tuna, 58 percent; turtle, 141 percent; charal (fresh water silverside), 33 percent; spiny lobster, 53 percent; sharks, 28 percent; red snapper, 33 percent; mackerel, 9 percent; mullet, 16 percent; croaker, 11 percent; schoolmaster, 4 percent; mojarra (a perch), 4 percent; and snook, 2 percent.

Catches declined for grouper, totoaba, wahoo, and oysters. ("Actividad Pesquera," Nov. 10, 1967.)

* * *

BUILDING MAJOR YUCATAN PORT

Mexico is building a port near Progreso on the Yucatan Peninsula. June 1968 is the planned completion date. Its main purpose will be to offer fishing vessels protection in stormy weather. Current facilities are a wharf on an open roadstead.

The new harbor will be built in a swamp separated from the sea by a strip of land. The basic construction plans are to dig a channel through the strip so vessels can come into the swamp. Fishing from the port should expand--with increased production of snappers and mero for the U. S. market. ("Mexico City News," Jan. 19, 1968; Regional Fisheries Attaché, U. S. Embassy, Mexico.)

* * *

MAZATLAN BOATYARD IS BUSY

Mexico's Astilleros Unidos del Pacifico, a Mazatlan boatyard, will build 21 fishing vessels during 1968. Total value will be US$1,798,800. Nineteen of the vessels will be exported to Japan, Korea, and Venezuela.

Mexico (Contd.):

During January 1968, orders were received for 2 shrimp trawlers for the United Kingdom, 4 for Brazil, and 17 for the Mazatlan fleet. Also, a $91,000 yacht was ordered by a U. S. company.

20 Shrimp Trawlers in 1967

During 1967, 20 shrimp trawlers were built worth US$1,440,000. Seven went to the local fleet and 13 to Brazil and Venezuela. Also, 243 vessels were repaired at a cost of US$260,000.

Further modernization of the shipyard is expected. ("El Heraldo," Jan. 15, 1968; Regional Fisheries Attaché, U. S. Embassy, Mexico, Jan. 24, 1968.)

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FRENCH TRAWLER CREW TO TEACH DEEP-WATER SHRIMP TRAWLING

The French trawler "Louis Caubriere" was expected to arrive in Mazatlan in late January to teach Mexican fishermen deep-water trawling for shrimp. The vessel is part of the fishery protocol signed by France and Mexico in mid-1967. Under it, French companies will furnish fishing vessels and machinery to develop Mexico's fishing industry.

French officials were in Mazatlan and enthusiasm was reported high to begin the venture. The freezing plant designated to handle the shrimp taken by the French vessel was ready to begin processing. (Regional Fisheries Attaché, U. S. Embassy, Mexico, Jan. 24, 1968.)

Peru

CHIMBOTE IS WORLD'S NO. 1 PORT IN LANDINGS

Chimbote, the Peruvian port where most anchoveta are landed, has the highest landings of any fishing port in the world. This has produced a problem. Although fishermen, processors, and other groups in the fishing industry say they are optimistic, it seems likely that several fish meal plants--the primary source of employment--will have to close permanently because of world prices for fish meal.

The tuna canning operations in Chimbote belong to the past: 69 canneries operated in 1963, today no more than 5. The largest cannery is closed. Another moved to Trujillo. Only Pesquera Chimbote and 4 very small canneries are producing bonito--and this only intermittently. An inadequate bonito fleet, strikes, demands for increased wages, and labor legislation improperly suited to seasonal operations, such as bonito fishing, have doomed this once-flourishing industry.

Fish Meal Plants Operate

The fish meal plants are operating, most at capacity. They have benefited from devaluation of the "sol" and from new tax benefits.

One plant was occupied by workers and closed down, apparently after the Industrial Bank refused credit. Pesquera del Santa and Fray Martin are producing alfalfa meal, using old fish-meal equipment. Costa Atunera, S. A., is producing meal from cannery offal and shipping the meal to Spain and Italy. Apparently, the product is well accepted there ("Pesca," October 1967.)

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REPORT ON FISH MEAL AND OIL PRODUCTION

Peruvian fishing was excellent in November and December 1967. Production and shipments were high. Stocks were 510,431 metric tons on Nov. 30, and 598,513 tons on Dec. 15 (a record for that date).

Table 1 - Fish Meal Production Through Mid-December 1967

	Nov.	Dec. 1-15	Sept. 1-Dec. 15	Jan. 1-Dec. 15
	(Metric Tons)			
Fish meal production	241,017	147,308	672,829	1,703,294
Fish meal shipments	160,988	58,527	439,914	1,452,411
Local sales & other uses	3,265	699	1/	27,535

1/Not available.

Table 2 - Fish Oil Exports Through November 1967

	Nov.	Sept.-Nov.	Jan.-Nov.
		(Metric Tons)	
Semirefined	11,866	15,535	119,118
Crude	10,127	10,663	61,231
Total	21,993	26,198	180,349

Peru (Contd.):

Table 3 - Fish Meal Exports Through Mid-December 1967

Zone and Area	Nov.	Dec. 1-15	Total Jan. 1-Dec. 15	Percentage of Total
	(Metric Tons)			%
I -U.S. & Canada	37,831	23,650	411,657	28.3
II -Latin America	11,583	2,800	85,692	5.9
III-Far East	11,811	4,376	53,972	3.7
IV-East. Europe	28,600	8,100	230,792	15.9
VI-West. Europe	47,559	12,051	407,500	28.1
VI-West Germany	23,604	7,550	262,798	18.1

As of Dec. 15, 1967, 106 plants were operating; 53 were closed; and 9 had been dismantled.

At the end of 1967, over 600,000 tons were in stock. (U. S. Embassy, Lima, Jan. 25, 1968.)

Colombia

REPORT ON CARIBBEAN COAST'S FISHING INDUSTRY

The fishing industry on Colombia's north coast is coastal, poorly organized, and primitive. Most fishing is done from canoes or from beaches. Fishermen use nets or lines with varying numbers of hooks; in inland lakes and rivers, they sometimes use lights and dynamite (both illegal) and spears; they dive for lobster. About 10,000 people are engaged in traditional fishing in the region.

Commercial fishing is centered in Cartagena, Barranquilla, Santa Marta, and Riohacha. Reportedly, 27 seagoing fishing boats with average displacement of 12 tons are engaged in commercial fishing. These boats usually employ lines rather than nets. Their catch is preserved with block ice. There are ice plants in Turbo, Cartagena, Barranquilla, and Santa Marta.

Fish Canning and Freezing

The fish canning and freezing industry on the north coast is concentrated in Barranquilla and Santa Marta. The plants are supplied by the 27 vessels. They also send trucks and agents to buy from fishermen.

In 1962 north coastal packers canned 521 metric tons of fish and froze 1,407 tons. By 1965, the totals had risen to 825 tons canned and 1,825 tons frozen. This is a small part of the total catch--estimated at 22,988 tons in 1962 and 24,472 in 1965. About 25 percent of this catch was robalo (snook).

Area's Potential Being Studied

The commercial fishing possibilities of the north coast of Colombia are being studied by a company called Pesquera Nacional. It is owned and organized by the Corporacion Financiera del Norte, ESSO Colombiana, Envases de Colombia, and others. It has hired a boat to fish those waters for a year.

In 1967, local interest in commercial fishing increased. It is directed especially to export oysters, shrimp, and spiny lobster to the U. S. and Puerto Rico. Exports are small. The largest shrimp exports are from Cartagena, canned oysters from Barranquilla, and spiny lobsters from Riohacha via Barranquilla. (U. S. Consulate, Barranquilla, Jan. 17, 1968.)

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GETS UNDP/FAO FISHERIES DEVELOPMENT PROJECT

A project for a marine fisheries development study was accepted on Dec. 17, 1967, by the Colombian Minister of Agriculture, the United Nations Development Program (UNDP), and FAO. Colombia had asked for UN Special Fund Assistance. The costs of the 4-year program, about US$2 million, are to be shared about equally by Colombia and the UN.

The project will: (a) provide advisory services to Government and industry to strengthen fishery administration, review factors affecting industry development, and to organize fishery research; (b) conduct surveys and experimental fishing to assess available resources and develop efficient methods of exploiting them; and (c) provide fellowships in fishery biology and fishing techniques.

Operation of Projects

Project headquarters will be in Bogota. Two permanent field stations, in Buenaventura and Cartagena, will be built with Colombian funds. The Government will be assisted in evaluating existing fishery policies, laws, regulations, and practices. It will act to improve these.

Colombia (Contd.):

The Government will establish, under the Ministry of Agriculture, a National Fisheries Research and Development Center to be project headquarters, and a Committee on Project Coordination and Supervision to support the industry.

The magnitude and biological characteristics of the resources in Colombian waters will be studied--and the efficient means to exploit them. Exploratory tests will be conducted by a fully equipped UN vessel.

Studies of the economics of the industry will be carried out. Local staff and fisheries people will be advised and trained.

What UN and Colombia Provide

The UN Special Fund will provide: (a) 264 man-months of expert service; (b) fellowships at estimated cost of $30,000; (c) equipment and supplies not over $401,000; (d) miscellaneous, estimated $30,000.

Colombia will provide: (a) 694 man-months of professional staff service; (b) 1,042 man-months of nonprofessional staff service; (c) land and buildings, estimated $92,369; (d) equipment and supplies, estimated $332,369; and (e) miscellaneous, estimated $33,920. (U. S. Embassy, Bogota, Feb. 8.)

Brazil

EXPANDS FROZEN FISH EXPORTS

A report indicating the availability of frozen catfish in Brazil for export resulted in 10 direct inquiries; two of these were followed by action. Two companies formed to export the fish are thriving--Productos de Pesca do Para, S. A., and Atlantics Pesca Ltda., both in Belem, Para.

The two are exporting annually about 800 metric tons of frozen catfish steaks and fillets to the U. S., destined for market in south central U. S. Most of the fish enters through New York City. Growth of this trade has encouraged increases in catch. At least one other firm is building facilities to process catfish for export. (U. S. Embassy, Rio de Janeiro, Jan. 10, 1968.)

The report from the U. S. Embassy coincides with others. According to a report from Atlanta, Georgia, large quantities of Brazilian catfish and croakers have appeared there. Mullet, trout, and other fish are expected soon. After success in marketing them, an Atlanta dealer recently contracted for 250,000 lbs. monthly of frozen dressed Brazilian croakers.

Chile

REPORT ON 1967 ANCHOVY CATCH, FISH MEAL AND OIL PRODUCTION

The Instituto de Fomento Pesquero has reported the following data for North Chile's anchovy catch and fish meal and oil production in 1967:

	1967	1966	1965
	(Metric Tons)		
Anchovy Catch:			
Dec.	58,800	17,900	103,200
Jan.-Dec.	664,740	1,047,697	422,197
Fish Meal Production:			
Jan.	15,983	33,504	12,836
Feb.	20,294	27,113	11,371
Mar.	7,794	13,536	10,278
Apr.	1,651	14,067	3,587
May	3,447	26,754	4,090
June	16,487	18,783	2,989
July	13,331	17,865	2,188
Aug.	6,054	17,978	3,651
Sept.	11,656	11,696	794
Oct.	11,408	2,687	888
Nov.	6,554	1,887	1,453
Dec.	11,093	3,634	16,454
Jan.-Dec.	125,752	189,504	70,579
Fish Oil Production:			
Dec.	1,278	572	1,063
Jan.-Dec.	9,899	18,706	7,234

ASIA

Japan

DEVELOPMENTS IN PURSE-SEINE TUNA FISHERY

The extension of tuna purse seining from around the Japanese home islands to the distant high seas is creating considerable interest. The fishery is divided broadly into one-boat purse seining in the South Pacific Ocean and two-boat seining in the Atlantic Ocean off West Africa. Both are experimental. No purse seiner has been licensed by the Government to engage in full-scale commercial fishing in distant waters. However, the fishery is drawing much attention: license applications (close to 20 one- and two-boat purse-seine units) are filed with the Fisheries Agency. Should the Agency decide to license a full-scale fishery in 1968, it will face a delicate situation licensing vessels.

Distant-Water Fishery

The distant-water purse-seine fishery started in 1962 in the South Pacific off New Guinea. In 1964, an experimental operation was started in the Atlantic off West Africa. In the South Pacific, Taiyo Fishing Co. (with Government support) conducted the first one-boat purse seine skipjack fishing off New Guinea with the power-block-equipped seiner "Kenyo Maru" (260 gross tons). The 1962-63 operation failed because of poor fishing. This resulted in a substantial financial loss for Taiyo and threatened the development of the South Pacific fishery.

However, in 1965, another fishing firm (Ogata Gyogyo) sent to the same region a one-boat seiner, the "Taikei Maru" (210 gross tons). The vessel was diverted from the slow fishing season (December-April) off northeastern Japan. The trip was a success and gave renewed impetus to the fishery.

At present, 4 one-boat purse seiners are operating in that region. Production is reported on target. The vessels and their owners are: "Taikei Maru" (210 gross tons), Ogata Gyogyo; "Nissho Maru" (250 gross tons), Nippon Kinkai Hogei; "Tokiwa Maru No. 58" (350 gross tons), Okura Gyogyo; and "Hayabusa Maru No. 3" (280 gross tons), Taiyo.

West African Grounds

In the West African fishing grounds, various nations have been conducting for many years pole-and-line skipjack fishing. Japan's entry into the purse-seine fishery began in 1964. Nichiro Fishing Co., stimulated by French seining there, began operations with 1 two-boat unit: the seiners "Kuroshio Maru Nos. 81 & 82" (each 145 gross tons). The West African fishery has abundant skipjack. It is profitable if conducted by independent vessels. But with mothership-type operations, it is difficult to meet expenses.

Despite financial setbacks, Nichiro continued its mothership operations. Now it has 4 two-boat seiner units and one mothership ("Chichibu Maru No. 2," 1,639 gross tons). Of the 4 units, 2 are owned by Nichiro and 1 each by Kawajiri Gyogyo and Aizawa Gyogyo. Because of high mothership costs, Kawajiri and Toyo Gyogyo plan to fish experimentally with a large, independent, 500-ton purse seiner. Kawajiri's new 500-ton "Hakuryu Maru No. 55" was headed toward the West African fishing grounds from the eastern Pacific. Another seiner is being built by Toyo Gyogyo and will be sent to W. African waters. The performance of the two vessels will be watched closely by the industry.

Short Purse-Seine History

The Fisheries Agency is moving cautiously with regard to licensing the Atlantic and South Pacific purse-seine fishery on a regular commercial basis because the Japanese purse-seine history in both regions is short. Also, doubt still exists over whether one-boat seining is preferable to two-boat. While one-boat is efficient, it injures fish more and so reduces their market value. It is urgent to divert purse seiners from coastal fisheries to distant waters for 2 reasons: mackerel and skipjack are abundant; there is need to reduce gear conflict in Japanese coastal waters.

5-Year Plan

The Fisheries Agency has prepared a 5-year program to develop new fishing grounds for the purse-seine and other distant-water fisheries. It was drawn up along with commissioning of Government research vessel

Japan (Contd.):

"Kaiyo Maru" (3,200 gross tons). The program includes tuna and mackerel surveys: 1st year (1968)--mackerel survey in South China Sea and skipjack in South Pacific; 2nd year (1969)--skipjack survey off West Africa; 3rd year (1970)--skipjack, west of Australia; 4th year (1971)--skipjack, off west coast of South America; and 5th year (1972)--skipjack, in Indian Ocean.

Industry Plans Too

Based on 5-year program, the Japan Fisheries Society (senior industry leaders) developed a long-range estimate of purse-seine fleet expansion and catch increase by ocean area. According to estimate, there will be a 2-year exploratory survey in 1968-69. This will be followed by the addition of two 500-ton one-boat purse seiners and one two-boat seiner in 1970. The estimated increase in annual tuna catch will be 6,330 metric tons.

In 1975, fleet expansion will bring total to 57 one- and two-boat seiners and production of around 14,000 tons. By 1982, fleet will reach 94 fishing units with catch of 233,000 tons. However, these projections depend on implementing resource surveys under the Government's 5-year resource development program.

Future Promising

Compared with present, fairly new, distant-water purse-seine fishery, the future is promising when tuna resources and availability of fishing grounds are considered. Like deep-water trawl fishery, it will not be affected by trend toward extension of territorial waters by coastal nations. Thus, the purse-seine system used by advanced fishing nations will become more important in Japanese fisheries. It will replace the inefficient long line and hook method. ("Nihon Suisan Shimbun," Jan. 1, 1968.)

* * *

TUNA CANNERS HAVE PROBLEMS

The Japanese tuna packing industry is faced with the difficulty arising from the high cost and scarcity of raw material. Early this year production was lagging, and sales for domestic and export markets had declined.

The export market in the U. S., West Germany, and other countries is weakening. Japanese trading firms are barely able to maintain their share of the canned tuna trade.

U. S. Competition

Concern is being expressed in Japan over the difficulty of boosting exports because U. S. packers are expanding canned tuna production. The U. S. packers have abundant raw material available. Moreover, they have reduced production costs through technological innovations.

To improve Japan's international competitive position, some Japanese trading firms are arranging to supply domestic packers with lower-priced tuna produced by other countries. ("Kanzume Nippo," Jan. 20, 1968.)

* * *

FROZEN TUNA EXPORT PRICES DROPPED IN 1967

The November 1967 average prices for albacore and yellowfin tuna were about the same as October's. Compared with November 1966, the albacore price fell by over US$30 a ton, and yellowfin by about $45 a ton.

The prices of frozen tuna for direct export to the U. S. during August-November 1967 were reported (see table) by the Japan Frozen Tuna Sales Co. ("Suisan Tsushin," Dec. 26, 1967.)

		Albacore (round)		Yellowfin (g.&g.)1/		Albacore Loins		Yellowfin Loins	
		1967	1966	1967	1966	1967	1966	1967	1966
		(US$/Short Ton, f.o.b. Japan)							
Nov.	High	468	505	413	460	1,053	1,060	875	940
	Low	455	485	395	425	984	1,060	849	911
	Average	466	499	409	453	999	1,060	854	932
Oct.	High	475	502	408	500	984	1,060	904	940
	Low	390	437	408	400	984	956	834	902
	Average	465	478	408	438	984	1,004	838	917
Sept.	High	478	485	410	425	990	962	900	913
	Low	466	440	380	400	990	936	890	820
	Average	472	451	409	417	990	955	890	843
Aug.	High	493	450	418	395	990	943	900	791
	Low	450	430	378	325	840	917	893	785
	Average	472	438	397	385	948	933	897	787

1/Gilled and gutted.

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Japan (Contd.):

SAURY CATCH DECLINED IN 1967

The 1967 Japanese saury fishery ended another poor season. The catch was 215,000 metric tons, only slightly above 1964's low of 200,000 tons. Since 1964, landings have been consistently low, running not much above 200,000 tons, or less than half the peak production of the past.

The poor season was ascribed to rough sea conditions in October and November 1967. Also, dense schools were absent in the early phase of the fishery. Because fish size was small, only 10 percent of the catch was sold for fresh consumption; 70 percent was frozen and 10 percent each canned and processed into fish meal.

Fishermen Worried

Fishermen are becoming increasingly concerned over the declining abundance of saury and growing Soviet operations off Japan. They are urging thorough investigation of the resource. However, they do not claim Soviet operations have caused a sharp decline in abundance. They are opposed to an all-out fishing regulation for this reason: should the fishery come under international regulation, the Japanese themselves also would be subject to treaty restrictions. ("Minato Shimbun," Jan. 11, 1968.)

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CUTS FROZEN SWORDFISH EXPORTS TO U. S. IN FY 1968

In early January 1968, the Japan Frozen Foods Exporters Association adopted a 4,500-short-ton quota of frozen swordfish exports to the U. S. for FY 1968 (April 1968-March 1969). This is a decrease of 1,000 tons from the FY 1967 quota. It was made because of the poor export performance last year. ("Katsuo-maguro Tsushin," Jan. 17, 1968.)

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TUNA SEINER IN EASTERN ATLANTIC

The 500-gross-ton Japanese purse seiner "Hakuryu Maru No. 55," departed for the West African tuna fishing grounds on Jan. 8, 1968. It was scheduled to pass through the Panama Canal around Feb. 3, en route to the eastern Atlantic Ocean to join the Nichiro Fishing Co.'s two-boat-type purse-seine fleet in the Gulf of Guinea.

First 1-Boat Seiner in Guinea Gulf

Since the "Hakuryu Maru" will be the first Japanese one-boat seiner to operate in that area, its performance will be watched by the home industry. Later, another 500-ton one-boat purse-seiner, now being built, is scheduled to join the fleet. ("Shin Suisan Shimbun Sokuho," Jan. 19, 1968.)

Note: An earlier report said the vessel departed Japan in mid-December 1967 and would fish off California, Mexico, and Central America until about June 1968 before joining the eastern Atlantic fishery.

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ATLANTIC TUNA EXPORT PRICES UNCHANGED

Japanese Atlantic tuna transshipments to the U. S. and Italy have remained relatively unchanged since late October 1967. Export prices for shipments, as of Dec. 30, 1967, were: U. S.: round albacore, f.o.b. $450 a short ton; yellowfin (gilled & gutted) f.o.b. $390 a short ton. Italy: yellowfin (gilled & gutted) c.i.f.c. (c.i.f. plus commission) $520 a metric ton; yellowfin (dressed without head and tail) c.i.f.c. $550 a ton; big-eyed (dressed) c.i.f.c. $365 a ton.

Foresee Steady Prices

The Japanese foresee no price increase for tuna transshipments to the U. S. because U. S. packers are not buying tuna from Japan at this time. This is because of the unclear outlook for 1968's local U. S. yellowfin and skipjack fisheries. Also, the U. S. packers have increased substantially tuna imports from South Korea and Formosa.

On the Italian market, indications are that prices may rise somewhat since canned tuna inventories at the packers' level are reported low, and the Italian packers again are showing buying interest in Japanese tuna. ("Katsuo-maguro Tsushin," Jan. 16, 1968.)

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Japan (Contd.):

TUNA IMPORTS INCREASE SHARPLY

Japanese fresh and frozen tuna imports in 1967 were up 50 percent from 1966, according to the Japanese Customs Bureau. Tuna imports have risen sharply in the past two years: from around 2,500 tons in 1965 to 10,796 tons in 1966, and to 16,184 tons in 1967.

The growing tuna demand, coupled with leveling off of Japanese production, is expected to boost imports in the years ahead.

Buys From Several Sources

In 1965, tuna were purchased mostly from Okinawan and South Korean vessels landing catches in Japanese ports. But, starting in 1967, purchases from South Korean and Taiwanese vessels operating in the Indian and Atlantic Oceans began to increase. Imports from those countries consist largely of bluefin and big-eyed--because the South Koreans and Taiwanese sell their albacore and yellowfin tuna catches primarily to the U. S. and Italy. ("Suisan Tsushin," Feb. 10, 1968.)

* * *

SHRIMP IMPORTS ROSE IN 1967

In 1967, Japanese frozen shrimp imports totaled 44,466 metric tons worth 28.7 billion yen (US$79.7 million) on a customs-clearance basis. This is an increase of 23 percent in volume and 33 percent in value over 1966 imports of 36,156 tons worth 21.6 billion yen ($60.1 million).

Shrimp Imports, 1964-67

Principal Country of Origin	Value 1967	Quantity Imported			
		1967	1966	1965	1964
	US$1,000	(Metric Tons)			
Soviet Union	10,314	9,836	6,518	1,632	54
Mexico	19,440	7,995	4,889	5,210	4,663
Thailand	7,412	5,090	3,691	1,976	1,485
Communist China	10,334	5,004	11,769	5,875	5,484
Hong Kong	3,213	3,002	3,170	2,579	1,679
India	2,777	2,147	993	850	642
South Korea	4,614	1,401	847	1,003	1,030
Australia	2,592	966	685	563	694
United States	1,916	754	230	17	192
Others	17,131	8,271	3,364	1,306	1,164
Total	79,743	44,466	36,156	21,011	17,087

The number of countries exporting shrimp to Japan also jumped from 28 nations in 1966 to 56 in 1967. The Soviet Union's 9,836 tons made her the leading shrimp exporter to Japan in 1967. ("Suisan Tsushin," Feb. 9, 1968.)

* * *

SAFETY PRECAUTIONS TIGHTENED IN JAPAN SEA

The Japanese Government has advised all her fishing vessels in the Japan Sea to observe strictly the safe navigation rules in the Maritime Accident Prevention Law. The Government acted to ensure the safe operation of Japanese fishing vessels because tension has heightened there since North Korea's seizure of the U. S. naval vessel "Pueblo."

One crab fishing vessel reported gear loss caused by passage of a huge foreign naval ship. Some fishermen claim their vessels were surrounded by foreign patrol boats.

Government Cautions Fishermen

Japanese fishing vessels in the Japan Sea (over 6,350 of them) have been cautioned to display the national flag clearly, refrain from approaching foreign military vessels operating in the area, and to stay away from South Korea's exclusive fishing zone.

The Government also has requested the U. S., the USSR, and South Korea to consider the safety of Japanese vessels fishing in the Japan Sea. ("Minato Shimbun," Feb. 10, 1968.)

* * *

PLANS LARGER TRAWLERS

Led by Nippon Suisan Kaisha, whose 3,910-ton "Niitaka Maru" left Japan Jan. 31 for Arctic waters, other large firms are moving up to 4,000-ton-class trawlers. The trend stems from dwindling local fishery revenues and the need to seek new distant-water grounds.

Besides the "Niitaka Maru," Nippon Suisan has completed another vessel of 3,950 tons, the "Fuji Maru." It plans 2 more trawlers of the 4,000-ton class this year.

Other Companies' Plans

Other companies with similar plans include Taiyo Fishing Co., Hoko Fishing Co.,

Japan (Contd.):

and Kyokuyo Hogei. Cost of these 4,000-ton-class trawlers is about US$2.8 million each.

Even European fishing companies that made early advances into pelagic fishing still lack 4,000-ton trawlers.

All the latest large Japanese trawlers are equipped with cold storage and filleting and meal-processing facilities. ("Japan Economic Journal," Feb. 6, 1968.)

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TALKS ON AUSTRALIAN 12-MILE FISHERY ZONE END

The Japanese-Australian talks in Canberra concerning continuation of Japanese fishing inside Australia's 12-mile exclusive fishery zone ended on Feb. 9 without agreement. The talks, which began Jan. 30, are expected to resume in late April or early May 1968.

Interim Agreement

An interim agreement was reached permitting Japan to continue fishing in the contiguous zone, except in one specified area.

At present, about 200 Japanese long-liners are fishing off the coasts of Australia. In 1967, they took 4,500 metric tons of tuna, mostly bluefin and yellowfin. The Japanese are also fishing shrimp in the Gulf of Carpentaria. ("Suisan Tsushin," Feb. 12, 1968.)

South Korea

PLANS FOOD PROCESSING EXPANSION

A South Korean fishery and agricultural exhibit will be held at Seoul in June 1968, sponsored by the Government-backed Agriculture and Fishery Development Corporation (AFDC). The exhibit will encourage domestic investment in agriculture and fisheries. It will feature commercial gardening, food processing, and marketing technology. AFDC's goal is to create large food-processing complexes to expand domestic consumption and to export fishery and agricultural products.

Adviser Sought

The Government also seeks a food-processing adviser for AFDC. His major responsibility will be to establish basic policies for future operations by selecting products to produce and ways of marketing them. AFDC expects to obtain the adviser from the U. S. food industry for an initial 6-month period. (U. S. Embassy, Seoul, Dec. 29, 1967, and Jan. 24, 1968.)

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TUNA FLEETS TO FISH IN INDIAN OCEAN

Two South Korean tuna fleets departed for the Indian Ocean early in January 1968. Ten vessels will stop at Shimonoseki, Japan, to refuel and pick up supplies, gear, and bait. The first fleet, which consists of 4 boats each 348 gross tons, belongs to Ko Ryo Distant-water Fishing Co. of Seoul. The second fleet consists of 6 vessels, each 91 tons, and is owned by A Jin Fishing Co. of Pusan.

Japan Permits Entry

Entry of foreign fishing vessels into Japanese ports is restricted, but these S. Korean fleets were permitted entry because they did not intend to fish off Japan.

The first fleet will operate out of Durban, South Africa, and second will be based at Penang, Malaysia. They were scheduled to begin fishing in mid-February 1968. ("Nihon Suisan Shimbun," Jan. 15, 1968.)

Taiwan

EXPANSION OF FISHERIES PLANNED

Taiwan has programed a 5-year fishery development plan to increase the catch from 497,000 metric tons in 1967 to 800,000 tons by 1972. A budget of NT$5.9 billion (US$146.2 million) will cover construction of tuna and other fishing vessels to more than double the existing tonnage of 142,000 gross tons.

An additional NT$5 million (US$125,000) will be loaned by the Joint U. S.-Taiwan Commission on Rural Reconstruction to marine processing plants. The loan will help plants improve the quality of marine products and so increase exports.

Taiwan (Contd.):

Technical Assistance

Also, the Joint Commission will provide technical assistance to the Provincial Marine Research Institute's 2-year study of fish culture and fish-processing techniques. The study is supported by a 1966 grant of US$150,000 from the Rockefeller Foundation. ("Taiwan Industrial Panorama.")

Malaysia

SHRIMP INDUSTRY EXPANDS IN NORTH BORNEO

Shrimp fishing for export is a fast-growing industry in the Brunei and Sabah regions of Malaysia. Two hundred trawlers operate year-round from the port of Sandakan to supply 2 freezing plants. Two more plants are planned.

Sabah Fishing and Industrial Co., Ltd. (SFIC) pioneered the export of frozen shrimp from Sandakan and currently purchases the catch of 75 trawlers. U. S. Federal standards are used as a guide during all phases of processing because most shrimp exports go to the U. S. Japan shares the largest remaining portion of the shrimp exports; markets in Scandinavia and South America also have been established.

Concern About Overfishing

Officials of SFIC, fearing shrimp stocks may become overfished, have suggested closed seasons. The Malaysia Government will carry out a survey early in 1968 to assess the condition of commercially important marine species, including shrimp. ("Daily Star," Dec. 12, 1967; "Borneo Bulletin," Dec. 16, 1967.)

SOUTH PACIFIC

Tahiti

REPORT ON SKIPJACK FISHERY

Ninety diesel-powered vessels (30 to 38 feet long and 70 to 160 hp.) are now fishing skipjack tuna with pole and line, without bait, from the port of Papeete in Tahiti. Each boat carries 2 or 3 men. Also, the same type of 3-man vessel is now operating in the long-line fishery. The fish are brought to market in Papeete and sold as fresh fish. One wooden Hawaiian sampan-type boat is now being constructed at the Papeete shipyard and is expected to be ready in March 1968.

Annual Catches

The annual catch of skipjack was about 730 metric tons in 1966 and 530 metric tons in 1967. These landings represent 43 percent and 29 percent of the total catch of fish (1,700 metric tons in 1966 and 1,850 metric tons in 1967). The total catch consisted of yellowfin tuna, big-eyed tuna, albacore, akule, reef fish, and skipjack tuna. There are some seasonal fluctuations in landings of skipjack tuna and other species.

Catch Below Demand

The present catch seems to be far below the demand. The population has grown rapidly from about 50,000 in 1962 through immigration from the French mainland, Algeria, and other French territories.

Fishing gear and techniques used are similar to those of the Hawaiian pole-and-line skipjack fishery. An exception in the use of artificial lures made of local "mother" or "half-pearl" shells. As soon as boated, tuna are killed by hitting the head with a wooden bar. Then they are eviscerated.

AFRICA

South Africa

DEVALUATION IS NOT EXPECTED TO HARM FISH MARKET

Great Britain's devaluation of the pound sterling should have virtually no effect on sales of South African canned fish, fish meal, or fish oil to that market, said the chairman of Federal Marine Ltd. The latter is the marketing company for the South African Inshore Fishing Industry. Because of its reasonable price and high protein value, canned pilchards as food could not be replaced on the British market. Therefore, its sales would not be affected by devaluation.

The fish meal and fish oil market depended entirely on Peru and would not be affected by devaluation.

Britain is one of the main buyers of canned fish and fish meal produced in South and South-West Africa. She takes the entire fish oil production. ("The South African Shipping News and Fishing Industry Review," Dec. 1967.)

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SOUTH AFRICAN HAKE SHOULD BE FROZEN AT SEA, U. K. REPORT SAYS

The latest annual report of Great Britain's Torry Research Station, covering work in 1966, includes the results of studies on the most suitable ways of processing Cape hake for the British market.

The report states: "The notorious softness of hake, as it is currently processed, often leads to unacceptable amounts of break-up, and so means of improving the appearance of such broken fillets with polyphosphate and brine dips were also looked into. These experiments appeared to be fairly successful although their products aroused a certain amount of controversy."

Rapid Chilling, Adequate Bleeding

Torry affirmed the importance of rapid chilling and adequate bleeding of the catch before freezing at sea, either as fillets or whole fish. The eating quality of hake frozen at sea has been shown superior in most cases to the more usual product frozen on shore after chilling at sea. Torry believes an improvement can be made on the quality of hake currently being imported from the southeast Atlantic."

U. K. Market Less Favorable

Under pressure of price-slashed exports from other producers, South African frozen fillets have not been doing as well in the United Kingdom as in 1966.

Imports for the first 9 months of 1967 show an increase of nearly 70,000 cwt. in fillets from all areas--from 509,470 cwt. to 578,336 cwt. But the total paid dropped from about US$17.2 million to $17.1 million. From 55,007 cwt. in the 9-month period in 1966, South Africa's share fell to 51,416 cwt; this earned $1.1 million, compared with $1.2 million.

Whole frozen hake, however, continues upward in Britain. Sales in 9 months of 58,064 cwt., worth $954,000, exceeded the 1966 total. They were far above the 39,356 cwt. and $708,000 of the first 9 months of 1966. ("The South African Shipping News and Fishing Industry Review," Dec. 1967.)

* * *

WILL SUBSIDIZE BUILDING FISHING VESSELS OVER 500 TONS

The South African Minister of Economic Affairs announced, at a new shipyard's opening in Durban in November 1967, that fishing vessels of 500 gross tons and over would qualify for the Government's shipbuilding subsidy. The minister stated that this assistance was very substantial; in fact, it exceeded that given to any comparable secondary industry. As shipbuilding continued to develop, both in Durban and Cape Town, he foresaw that the Government's financial burden would become considerable.

Government Aid Will Lessen

The assistance had been designed to put shipbuilding on its feet as rapidly as possible. The Government was determined to reduce its help as soon as possible. For this reason, the minister said, industry progress would be carefully watched. The Government intended to develop Rietvlei in Table Bay as a modern fish harbor--and provide for the development of a large shipbuilding industry.

Government Aid Welcomed

The chairman of the shipyard corporation said of the aid: "It is welcomed by us, and I

Africa (Contd.):

am sure, by the fishing fraternity.... It will, without doubt, assist them greatly in their fight to compete with the big overseas trawlers which are invading our traditional fishing waters in ever increasing numbers." ("The South African Shipping News and Fishing Industry Review," Dec. 1967.)

Spanish Sahara

JAPANESE TRAWLER SEIZED
OFF SPANISH SAHARA

The Japanese trawler "Inase Maru No. 1" (300 gross tons) was seized off the coast of Spanish Sahara by the Spanish Navy on Dec. 27, 1967. The captain was charged with violating Spain's 12-mile exclusive fishery zone. This is Spain's first seizure of a Japanese vessel involving violation of the 12-mile zone.

The Japanese report that the trawler was seized 12.3 nautical miles off the territorial coast. The vessel was escorted to Las Palmas, where her catch of about 7 tons of "Monko" squid and other fish were confiscated. Also, she will be fined anywhere between US$850 and $8,500. ("Suisancho Nippo," Jan. 6, 1968.)

Cameroon

NEW U. S.-CAMEROON
SHRIMP FISHING VENTURE

In late 1967, the Government of Cameroon granted significant concessions on taxes and import duties to a new shrimping company--Crevettes du Cameroun. Now the firm has only to find a suitable site on the Douala waterfront to begin operations.

The firm is a joint venture of the subsidiary of a U. S. seafood company and the Cameroonian fishing firm SOPECOBA. It is being established with initial capital of US$700,000: the U. S. firm 50 percent, Cameroon 15 percent, and the remainder from SOPECOBA and its shareholders.

SOPECOBA Pioneered

SOPECOBA was established at Douala in November 1952 with $152,000. It pioneered industrial fishing and now operates 4 trawlers. Its annual production of fresh fish is 4,500 metric tons. As of June 30, 1966, its investment had grown to $563,000.

Crevettes' Operations

Crevettes du Cameroun will catch, process, and freeze shrimp for export, almost all to the U. S. Eight specially equipped steel trawlers will fish for the 2 varieties of shrimp most common to the Gulf of Guinea: the Penaeus duorarum and the Penaeus aztecus (brown shrimp).

Seven of the trawlers are 70 feet long and will be able to remain at sea up to 20 days. The eighth will be larger and capable of more extensive operations.

Shore installations will comprise harbor facilities for the trawler fleet and a modern plant to sort, clean, freeze, and pack up to 4 metric tons of shrimp per day, in 5-lb. cartons. The plant also will be capable of producing 40 metric tons of ice per day.

The Operating Plan

To operate profitably, the firm sees a minimum annual production of 680 metric tons, or 300,000 5-lb. cartons. This will require landing 750 metric tons (8.5 tons per boat per month for 11 months of the year). The company will employ 88 persons (41 on vessels, 47 on shore). At the outset, the trawler captains will be Latin Americans with long experience in shrimp fishing. However, they also will train Cameroonian fishermen. The vessels will have Cameroonian registry.

Operations are scheduled to begin in August. The new enterprise unquestionably represents an investment favorable to that country's economic development. Beside the influx of foreign capital and the employment and training provided, its 8 vessels will increase by 50 percent the size of the commercial fishing fleet (15 vessels now).

The shrimp exports will earn about US$1 million a year in foreign exchange, and an estimated $32,000 in revenues from export taxes. (U. S. Embassy, Yaounde, Feb. 6, 1968.)

INDEX

Page

UNITED STATES:
Events and Trends:

1 .. 1967 U. S. Shrimp Landings Set Record
2 .. Set 1968 Tariff Rates for Groundfish Fillet Imports
2 .. 1967 U. S. Salmon Landings Were Way Down
3 .. 1967 U. S. Fish Meal, Oil, and Solubles Production Declined
3 .. U. S. Fish Meal Prices Strongly Affected by Peru's 'Sole' Devaluation
3 .. Georges Bank Survey Shows More Cod, Fewer Haddock
4 .. New World Whaling Rules to Bring U. S. Changes
4 .. U. S. and 4 States Plan Lake Michigan Clean-up
5 .. Promote Halibut to Overcome Depressed Market
5 .. New Loran Stations in Gulf of Mexico
5 .. Study Effects of Warmed Columbia River on Living Things
6 .. Lake Erie Commercial Catch Was Down in 1967
6 .. President Asks for Fish Inspection Act
Oceanography:
7 .. Seismic Survey Planned for East Coast
7 .. Scripps Vessel Begins Bering Sea Research
8 .. LASER Beam Can Aid Hurricane Forecasting
8 .. Survey Fixes Navigational Hazards Along N. J. Coast
9 .. First Hydrographic Survey in 40 Years Begins in Southern Puerto Rican Waters
9 .. South Pacific Is Deeper, More Mountainous Than Thought
9 .. Coast Guard to Set Up 'Divided Highway' for San Francisco Waters
10 .. New Book Portrays Oceans' Promises and Challenges
11 .. Foreign Fishing Off U. S. in January 1968
States:
California:
13 .. Fisheries Are Part of EDA Study for San Diego
13 .. Anchovies Dominant in Pelagic Fish Surveys
Florida:
14 .. EDA Approves Funds to Develop Jobs in Fishing Industry
14 .. Greater Use of Calico Scallop Beds Expected
Texas:
14 .. FPC Pilot-Research Plant at Texas A & M
Oregon:
14 .. First State-U. S. Financing of Salmon Hatchery
Oregon-Washington
15 .. Fall Chinook From U. S. Hatcheries Planted in Willamette
Virginia:
15 .. VIMS Scientists Tag Striped Bass
New York:
16 .. 7½-Foot Sturgeon Found in Hudson
Maine:
17 .. Coastal Pipeline Stocks Lobsters As 1968 Began

Page

UNITED STATES (Contd.):
States (Contd.):
Alaska:
17 .. The Fisheries in 1967
Bureau of Commercial Fisheries Programs:
18 .. Chemical Control of Oyster Predators Pays Off
18 .. Collapsible Lobster Pot Is Suited for Continental Slope Fishing
18 .. These Lobsters Prefer Artificial Reef As Home
19 .. Aid to Florida's Thread Herring Fishery
19 .. Aid to A.I.D.
19 .. "Oregon" Surveys Midwater Schoolfish
21 .. Purse Seining Off Africa's West Coast, by David C. Simmons
22 .. Survey Hake Larvae in Northern Part of California Current, by Paul E. Smith
24 .. 'Delaware' Finds Northern Shrimp in W. Gulf of Maine
25 .. BCF Promotes Fish in Milan
25 .. Flying Fresh Fish to Market
25 .. What We Know About Tuna's Behavior at Sea
ARTICLES:
27 .. Oceanography's Role in Developing Marine Resources, by James H. Johnson
39 .. Improving and Expanding the Distribution of Fresh (Unfrozen) Seafoods by Means of Insulated Containers, by Staff of the BCF Technological Laboratory, Gloucester, Massachusetts
43 .. Submarine Photos of Commercial Shellfish Off Northeastern United States, by Roland L. Wigley and K. O. Emery
INTERNATIONAL
50 .. Plans for EEC Fisheries Policy Delayed
50 .. The Fish Meal Situation
50 .. USDA Forecasts Increase in 1968 World Marine Oil Production
51 .. Commission Sets 1968 North Pacific Halibut Regulations
52 .. More Nations Sign N. Atlantic Fishing Operations Convention
52 .. Northeast Atlantic Enforcement Scheme Stalled
52 .. UN/FAO Caribbean Project's "Calamar" Is Active
53 .. Poland and Canada May Exchange Fishery Enforcement Officers
53 .. Mexico and Japan Agree on Fishing Off Mexico
53 .. Sign Southeast Asian Fishery Development Center Pact
54 .. Survey Indonesian Fishing Grounds
54 .. Japanese/Italian Tuna Mothership Reports Good W. African Fishing
54 .. FAO Conference on Fishing Research Vessels, Seattle, May 18-24
55 .. Sockeye and Pink Salmon Predictions for 1968
55 .. FAO Orders 2 Multipurpose Fishing Vessels in Norway
55 .. Symposium on Marine Food Chains, Denmark, July
55 .. 17th Int'l Congress of Limnology, Jerusalem, August
55 .. North Pacific Fur Seal Commission to Meet in Moscow
56 .. New Book on North Pacific Fisheries Treaties

Index continued page 75.

INDEX (CONTINUED)

Page

FOREIGN:
Canada:
57 .. Seal Season Shortened
57 .. May Establish A New Marketing Agency
57 .. Fur Seal Prices Rise Slightly
57 .. 1967 Cold-Storage Holdings
57 .. Government Prints Booklet on Care of Fish in Retail Stores
Europe:
58 .. 1967 Salmon Catch Off Greenland Near 1964 Record
Iceland:
58 .. 1967 Catch Declines
58 .. Temporary Solution Found to Fish Plant Shutdown
United Kingdom:
59 .. Interest in Oceanography Grows
USSR:
59 .. New Aquarium Near Black Sea
Portugal:
60 .. Canned Fish Pack Up, Exports Down
Denmark:
60 .. New Shrimp Fishery Possible
Norway:
60 .. Possible Depletion of Salmon Stocks Feared
61 .. Price Decline Hits Klipfish Exports
61 .. Report on 1966-67 Landings and Value
61 .. Use of Industrial Fish Landings in 1967
Latin America:
62 .. Peace Corps Wants 60 Biologists for Fisheries Projects
Mexico:
62 .. Consumption of Shrimp Increases
62 .. Catch Was Up in First 9 Months of 1967
62 .. Building Major Yucatan Port
62 .. Mazatlan Boatyard Is Busy
63 .. French Trawler Crew to Teach Deep-Water Shrimp Trawling
Peru:
63 .. Chimbote Is World's No. 1 Port in Landings
63 .. Report on Fish Meal and Oil Production
Colombia:
64 .. Report on Caribbean Coast's Fishing Industry
64 .. Gets UNDP/FAO Fisheries Development Project

Page

FOREIGN (Contd.):
Latin America (Contd.):
Brazil:
65 .. Expands Frozen Fish Exports
Chile:
65 .. Report on 1967 Anchovy Catch, Fish Meal and Oil Production
Asia:
Japan:
66 .. Developments in Purse-Seine Tuna Fishery
67 .. Tuna Canners Have Problems
67 .. Frozen Tuna Export Prices Dropped in 1967
68 .. Saury Catch Declined in 1967
68 .. Cuts Frozen Swordfish Exports to U. S. in FY 1968
68 .. Tuna Seiner in Eastern Atlantic
68 .. Atlantic Tuna Export Prices Unchanged
69 .. Tuna Imports Increase Sharply
69 .. Shrimp Imports Rose in 1967
69 .. Safety Precautions Tightened in Japan Sea
69 .. Plans Larger Trawlers
70 .. Talks on Australian 12-Mile Fishery Zone End
South Korea:
70 .. Plans Food Processing Expansion
70 .. Tuna Fleets to Fish in Indian Ocean
Taiwan:
70 .. Expansion of Fisheries Planned
Malaysia:
71 .. Shrimp Industry Expands in North Borneo
South Pacific:
Tahiti:
71 .. Report on Skipjack Fishery
Africa:
South Africa:
72 .. Devaluation Is Not Expected to Harm Fish Market
72 .. South African Hake Should Be Frozen At Sea, U. K. Report Says
72 .. Will Subsidize Building Fishing Vessels Over 500 Tons
Spanish Sahara:
73 .. Japanese Trawler Seized Off Spanish Sahara
Cameroon:
73 .. New U. S.-Cameroon Shrimp Fishing Venture

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ON PAGE 78

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